PRODUCTS finishing

Volume 10 FEBRUARY, 1946 Number 5

FRED W. VOGEL, *Editor*
(On leave in Armed Forces of U. S.)

ROBERT I. SHORE
Associate Editor

•

Consulting Editors
BRYANT W. POCOCK
H. LEROY BEAVER

Contributors
C. B. F. YOUNG
ALLEN G. GRAY

•

Member

CCA

CONTENTS

Editorial 33
Use of Animal Glue in Polishing Wheels..... 34
Finishing Clinic 40
By DR. ALLEN G. GRAY
Electricity for the Plater, Part VII..... 52
By D. A. COTTON
Spray-Booth Lighting 62
By W. H. KAHLER
Urea in Acid Copper Plating Solutions..... 64
By WALTER BRENNER and DR. C. B. F. YOUNG
Custom Finishing on a Mass-Production Basis... 76
By E. W. SINCLAIRE
Fire Protection for Electrical Apparatus..... 78
Are Porcelain Enamels Threatened by New Plastics? 80
By DR. G. H. McINTYRE
News of the Industry..... 84
New Equipment and Materials..... 92
Opportunity Section 114
The Finishing Touch 116
Catalog Library 118
Index to Advertisements 120

Published monthly by GARDNER PUBLICATIONS, Inc., 431 Main St., Cincinnati 2, Ohio. MAin 0182

DON G. GARDNER
President and General Manager

JOHN M. KRINGS
Advertising Manager

JESSE R. HARLAN
Manager

G. M. FILLMORE
Eastern Manager
342 Madison Ave., New York (17)
Murray Hill 6-3899

GEORGE H. MEYERS
Western Manager
Tribune Tower, Chicago (11)
Delaware 5441

CHARLES H. DEILY, JR.
District Manager
8134 Germantown Ave.
Philadelphia (18)
Chestnut Hill 2639

RALPH M. FRENCH
District Manager
15820 S. Moreland Blvd.
Shaker Heights (20), Ohio
Skyline 1170

Printed in U. S. A. Copyright 1946 by Gardner Publications, Inc.

Cowles
KW
CLEAN-BRIGHT
BRASS CLEANER
• A new outstanding COWLES CLEANER for non-tarnishing cleaning of polished and unpolished brass, copper and bronze in still tanks with or without electric current—also in all types of washing machine equipment. Cowles K W does not attack the metal. It is fast, efficient and economical. Immediate shipment from warehouse stocks.
Cowles
TECHNICAL
SERVICE
on request
THE COWLES DETERGENT CO.
METAL CLEANER DEPT.
7016 EUCLID AVENUE • CLEVELAND 3, OHIO

Products Finishing

The Threshold

Science, as a result of wartime achievements, has now attained a position of eminence, respect, and responsibility never before reached in this or any other country. The scientific worker, provided the opportunity by progressive industry, heaped honor upon honor on his record of performance and safely brought the nation through a period of critical anxiety by devising ingenious materials that tipped the scale of battle in favor of the United Nations. Many volumes could be written on what chemists, metallurgists, biologists, and physicists did to promote the war effort. A separate book would be needed to tell what metallurgists did to improve and produce each one of the necessary metals. It would require still more books to tell of the laboratory's part in harnessing atomic energy, in producing the different explosives, also the new plastics, the different synthetic rubbers, and aviation gasoline, to mention only a few.

For a specific example in the finishing industry, paint chemists, confronted with shortages of both vehicles and pigments, formulated wartime paints which, in many cases, served as well, or better, than the material made with imported components. In addition to increased production for painting Army installations, machines, and equipment, the paint industry devised many special finishes for particular applications, such as anti-fouling paint for use on ship bottoms. In another instance, our tin supply was stretched threefold by a new process whereby tin was applied electrolytically to sheet metal, and new varnishes and lacquers were substituted for tin in some instances.

Add it all up and then chalk up to the credit of our national experience in four years of war one outstanding benefit! It is the new appreciation of the importance of scientific research. Beginning with V-J Day, industrial corporations have been announcing plans for the erection of new laboratories, "research centers," and other facilities for the expansion of scientific research activity. Millions of dollars have been authorized for this purpose simply because hard-boiled, profit-minded management has convinced directors and stockholders that liberal investments in scientific investigation not only are necessary for the survival of a going business but are definitely profitable.

FEBRUARY, 1946 **Vol. 10, No. 5**

Use of Animal Glue in Polishing Wheels

SHOULD a glue manufacturer or supplier choose two words conditioning the efficient use of his product for polishing wheels, he would probably select "temperature" and "humidity." However, before making specific suggestions on the proper methods of preparing, using, and conditioning the glue after application to the wheels, it may be well to start at the beginning or when glue is received in the consumer's plant.

Here, fortunately, animal glue in the dry state is quite resistant to temperature and humidity changes. By actual experience, it has been found to retain its original quality when subjected to temperatures ranging from zero to 140 deg. F. in cross country shipments. Likewise, it has not been adversely affected in storage when subjected to prevailing atmospheric humidities ranging all the way from 10 to 100 per cent. Little caution is necessary in storing so long as the glue is placed in the warehouse in such a manner that it is protected at all times from direct contact with water from any source (rain, leaks,

The well-ordered arrangement of the set-up room illustrated above is the goal of all polishing room foremen. In this draft-free room, glue bonding solutions are heated and the glued wheel heads rolled through abrasive grain and then tested.
(Photo Courtesy Norton Company)

and so on). In other words, if it is stored in what is considered a cool, dry place, there is good evidence it will last indefinitely.

Glue Make-Ready

In preparing glue for use, temperature rules must be observed to obtain a solution of maximum strength. It is advisable at all times to weigh both glue and water before mixing. Individual glue flakes and grains vary in size, and weighing is necessary to ensure that the proportion of glue to water is constant. Glue should then be poured into cold, pure water. The colder the water, the faster and greater the swelling. Pouring glue into hot water is not recommended as the best practice. Where possible, water used for soaking should be between 30 and 60 deg. F. Moreover, the soaking operation should be carried out in a cool place in the plant.

Ground glue should be soaked for at least one hour, and flake glue for at least six hours. When the glue is ready to be melted, it is heated in a water jacketed kettle. The temperature of the melting glue should not go above 140 deg. F. since overheating breaks down some of the protein structure and results in high loss of strength. Should the glue solution be heated for 10 hours at 200 deg. F., for example, more than 50 per cent of its adhesive strength is lost. A melting temperature of 140 deg. F. is a normal one; it allows for a cooling of 5 deg. when the glue is strongest. Loss of strength through overheating can be avoided by preparing only enough glue for immediate use under proper temperature control in thoroughly cleaned utensils.

Climate Control in Wheel Setup

Considerable progress has been made toward the control of atmospheric conditions in the wheel set-up room. Polishing room men are climate conscious and theromometers and hygrometers to measure the amount of moisture in the air have become standard equipment. Air conditioning and dehumidifying units have done much to eliminate difficulties formerly caused by excessive humidity.

Glue is equally sensitive to cold and heat, and uniform temperature must be maintained to have polishing wheel heads set correctly. Experience has shown that a temperature of 80 deg. F. and a relative humidity between 45 and 55 per cent provides ideal set-up conditions. In addition to constant temperature and humidity, the polishing room must be free of drafts and so arranged that glue can be applied to the wheel and the entire set-up operation carried out as quickly as possible to prevent rapid glue jellying. A glue that jells during set up is a poor adhesive for abrasive grain since the grain will not penetrate the jelled glue film. Grain will not pack as well on this type of a glue head which means that there is too much glue and too little grain for efficient polishing. Wheel heads that are underpacked cut too slowly and generate excessive heat.

Draft may cause the glue liquor to jell even in the short interval between the time the glue is removed from the pot on a brush and applied to the face of the wheel. Accordingly, the layout of the polishing room will dictate that windows and doors be "draft proofed," and that the polishing wheel be placed as close to the glue kettle as possible. The hot glue solution is applied to the face of the wheel with a brush and the wheel immediately rolled in a trough of abrasive grain until it has picked up all the grain it will hold. The glue coating will pick up grain in proportion to the amount of pressure that is applied in rolling the wheel through the trough. Therefore, it is necessary to maintain uniform pressure in order for uniform

polishing results to be obtained.

Temperature is again a controlling factor when glue is applied to the face of the wheel and the abrasive grain. A cold surface coming into contact with hot glue will shock it, causing initial set and thus reducing the holding strength of the glue. Actually, the action is similar to that of a cold draft striking the glue, and the results are the same—glue loses much of its holding power and shrinkage cracks may develop across the face of the wheel head .

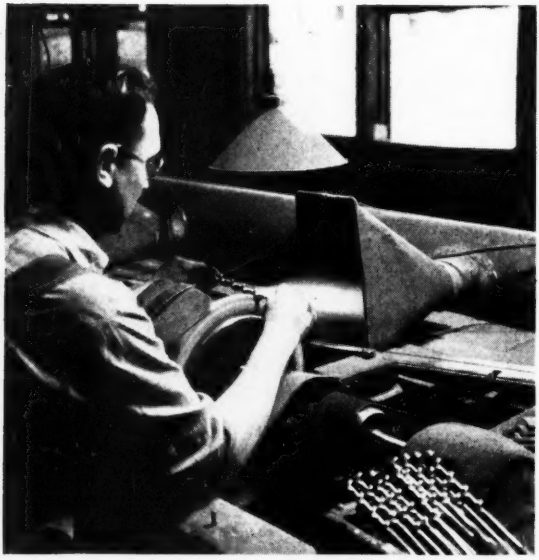
In order to eliminate this danger, provision should be made in the polishing room to heat both wheel and abrasive grain to temperatures between 100 and 120 deg. F. Where the other wheel head components are heated, glue can be applied at its normal melting temperature of 140 deg. Fahrenheit.

What are the results of heating wheel and abrasives? First, it allows the glue to set slowly and naturally instead of causing it to jell quickly. Slow setting allows glue to attain maximum strength under normal conditions. Chilling or jellying the glue does not allow for proper penetration. Then again, the weakness of too rapid jellying is threefold: it may result from lack of contact; from poor adhesion owing to the inability of the glue jelly to **wet** and hold wheel or grain; and from internal stresses set up when drying an excessively thick layer of glue.

Drying Room Conditions

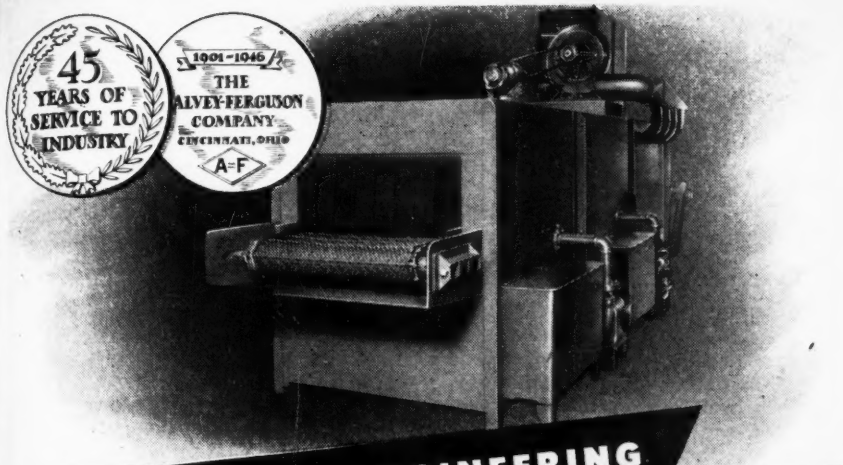
When the set-up wheel is transferred to the drying room, atmospheric conditions are still subject to control to ensure that the dried wheel is free of defects that will result in short life or sub-standard performance.

Animal glue is a reversible colloid; that is, it is capable of alternately jelling and drying. As a result, it has the ability to absorb or give off moisture. In cold water while soaking, for example, it may absorb as much as ten times its weight in water. Glue is at its strongest when its moisture is at a certain level — 10 to 12 per cent. Thus, temperature and humidity of the drying room are adjusted to allow the glue head to reach this level of maximum strength. Ideal drying conditions have been found to be 85 deg. F. and 50 per cent relative humidity.



"Shaped" glue-bonded wheels are used for polishing purposes in many industries. In this illustration, augurs are shown being polished with a round nose wheel.

(Photo Courtesy Norton Company)



45 Years of ENGINEERING PERFECTED THIS MACHINE

SINCE 1901, The Alvey-Ferguson Company has been "first in the field" in engineering conveyor systems for handling a wide variety of materials, parts and products.

And as *correct handling* is the first essential to *correct cleaning,* this 45 years' experience has enabled A-F Engineers to perfect metal parts and products cleaning and finishing machines that are more efficient and economical!

The A-F Cleaning Machine shown here is a self-contained wash, rinse and combination hot blow-off and speed-dry unit, for *thoro*-cleaning castings and machined parts.

There is an A-F Cleaning Machine, either a "standard" or an especially designed unit that will save time and money in cleaning and finishing *your* metal parts and products. Why not investigate? Write today.

The ALVEY-FERGUSON COMPANY *Offices in Principal Cities* **624 Disney St., Cincinnati 9, Ohio**

Affiliated Corporation: **THE ALVEY-FERGUSON COMPANY OF CALIFORNIA**
P. O. Box 396, Vernon Branch, Los Angeles 11, Calif.

Alvey-Ferguson

Wheel drying rooms have also obtained satisfactory results at 75 deg. F. and 45 per cent relative humidity, or 90 deg. F. and 55 per cent relative humidity. If the proper drying conditions are maintained, most one coat polishing wheels can be dried within 24 hours and double coated wheels in 48 hours. Air conditioning and dehumidifying units enable both small and large polishing rooms to maintain uniform conditions throughout the manufacturing season. This is a long step forward from the time that polishing rooms had to shut down for weeks because excessive humidity did not allow wheel heads to set, with resultant poor wheel life and performance.

Atmospheric conditions being uniform, the variables that affect drying time are the density and thickness of the abrasive glue head and the density of the material forming the wheel face. Most important is the thickness of the wheel head. The strength of the glue, the abrasive grain size, and the number of coats determine the thickness of the head, and the thicker the head, the longer the drying time. The glue solution, and hence the head, will be thicker or thinner depending upon the type of work to be done by the polishing wheel. Plows will illustrate this point. Wheels set up for this coarse work require more glue and more drying time than those set up for fine work. Both types may have the same number of coats but if the glue is variable, the drying time will be different for each.

Failure to dry the wheel properly may result in under or overdrying. Where the wheel is underdried, the glue head does not attain full strength. An underdried wheel cuts slowly, glazes rapidly, and may even lose chunks of the head in operation. Overdrying causes brittleness and failure of the glue to hold the grain. Grains will have a tendency to tear out of their sockets before they have performed maximum work. To test a wheel that is drying, hit it with a round steel bar and observe the readiness with which it cracks. If still wet, it will not crack. If the wheel is too dry, it will crack and splinter readily.

Millions of pounds of animal glue are used annually in the manufacture of polishing wheels and coated abrasives. Glues developed for polishing wheels are capable of withstanding tremendous pressure at high speeds under fricitional heat. Where used properly, glue bonds attain a tensile strength of between 5,000 and 10,000 pounds per square inch. Only the metals are higher in tensile strength. A combination of natural qualities and wartime research and applications will bring new "plus" factors in the application of animal glue for polishing wheel use.

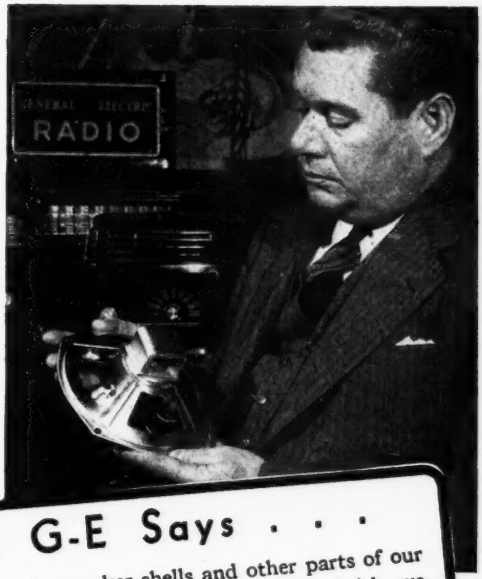
(Courtesy Animal Glue Information Service, New York, N. Y.)

"Alrosol," a detergent and wetting agent of the fatty amide type which is said to be soluble in an unusually wide range of organic solvents, is the subject of a 12-page technical bulletin prepared by the Alrose Chemical Co., Box 1294, Providence 1, R. I. Copy of the bulletin, together with a sample of Alrosol, is available free to mechanical executives upon request.

"Belt Sanding of Metal" is the subject of a 12-page illustrated bulletin released by the Clover Manufacturing Co., Norwalk, Conn. The bulletin provides descriptive information on the following subjects: "Belt Sanders;" "The Machine-Shop Bench Sander;" "Substitution of an Abrasive Belt for the Grinding Wheel;" "Polishing and Grinding Irregular Surfaces;" "Vertical Belt Sanders;" "The Use of Coolants;" "The Use of the Standard Glue Bonded Belt with a Coolant;" "Converting a Dry Sander for Use with an Oil Coolant;" and "Sanding Small Pieces." Copy free upon request.

GE chooses Luster-on

Engineers at General Electric looked over the field and chose Luster-on* for the protective bright dip for zinc plated parts on their new 1946 radios. Read their statement — it tells the whole story of Luster-on superiority. Then send the coupon and a sample part for proof that you can see with your own eyes.



Here's What G-E Says . . .

We are using Luster-on on the chassis, speaker shells and other parts of our current radio line. Over and above the pleasing brilliancy of the finish, we find that with Luster-on we experience no difficulty in spot welding directly on finished surfaces, thus speeding production; and Luster-on affords protection from corrosion and salts formation to the parts treated, thereby promoting a greater expectancy of continued good service from our radios.

Paul L. Chamberlain
Manager of Sales
RECEIVER DIVISION

10

*Patent applied for

THE Chemical CORPORATION
54 Waltham Ave., Springfield 9, Mass.

THE CHEMICAL CORPORATION
54 Waltham Ave., Springfield 9, Mass.

Please send me full particulars about Luster-on* bright dip for zinc surfaces. I am (am not) sending sample part for free dip. No obligation, of course.

Name.....

Address.....

Finishing Clinic

By DR. ALLEN G. GRAY

•

A Monthly Digest on Current Technical Progress Indicating Significant Trends and Developments in the Finishing Industry

•

THIS MONTH . . . Porcelain Enamels of Unusual Corrosion Resistance . . . Electropolishing Provides a New Finish for Some Products . . . Automatic Spray Painting Often Is Warranted for Relatively Low Production . . . Finishes for Aluminum by Chemical Treatment . . . Certain Cold Rolled Steels May Require Special Pickle Prior to Finishing . . . The Silicones and Their Possibilities.

Porcelain Enamels of Unusual Corrosion Resistance

DURING the war, many new types of corrosion resistant ceramic coatings or porcelain enamels were developed for ferrous metals. It was found that many articles formerly manufactured from heat-resistant and corrosion-resistant metal alloys could be manufactured at lower costs from available low carbon enameling stock and mild steel (10-20) and coated with one or two applications of special enamels. Frequently, these enameled items were found to be better than the original made from metal alloys. This was particularly true for engine exhaust systems of airplanes and tanks. These interesting new developments in porcelain enamels were discussed by Dr. G. H. McIntyre (Ferro Enamel Corporation) before the Symposium on "Modern Metal Protection" sponsored by the Cleveland, Ohio Section of the Electrochemical Society ("Steel," October 15, 1945).

Porcelain enamel is a highly corrosion resistant inorganic substance. Generally, it has been used commercially, not so much because of this property but for the reason that it is colorful, durable, easily cleaned, and economical to apply. Thus, it has found its largest usage as a finish for such items as stoves, refrigerators, washing machines, cooking ware, bath tubs, lavatories, and electric light reflectors. However, its possibilities as a functional finish, strictly for high corrosion resistance, have only recently been fully recognized and exploited.

Porcelain enamel is a completely inorganic substance which by composition is a glass that can be bonded by a fusion process to a metal

base—usually iron. It should be distinguished from the organic or paint "enamel," which substance is strictly organic in composition and is not matured by fusion at high temperature. Enamels are formulated to yield properties suitable to the use for which the enameled article is designed. Uniform specifications cannot be applied to all enamels for all purposes. All enamels are not made acid resistant because, in general, these types of enamels are more difficult to apply, which means relatively higher costs in the process. Acid resistance does not always guarantee that the enamel will be suited to the conditions of service. For example, weather and water-resisting enamels may be also acid resisting, but all acid-resisting enamels are not weather and water resistant.

New types of enamels were produced and used in the manufacture of hot water storage tanks for government and private housing. Enamels completely resistant to the solvent action of hot water under pressure had not been discovered prior to the war. Such enamels are now available and undoubtedly will be used in the postwar period.

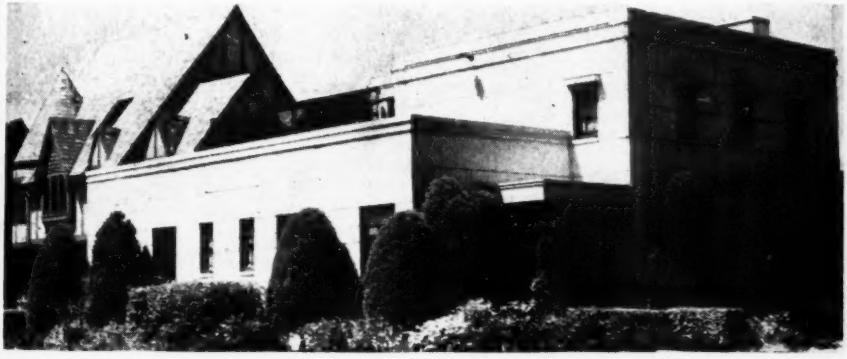
The average manufacturer of enameled articles has thought of porcelain enamel in terms of its beauty and average mild corrosion problems and does not realize that for chemical and complete weathering resistance, the surface of the metal must be completely covered. Thus, articles are sometimes enameled and put into service with minute spots of the surface not covered. Enamel does not offer any electrolytic resistance to corrosion as do some types of metallic coatings and corrosion will occur rapidly in such unprotected areas. In many applications, porcelain enamel may be found to be the ideal corrosion-resistant coating for iron and mild steel. It is also adaptable to copper and aluminum and has been used to advantage on them.

* * *

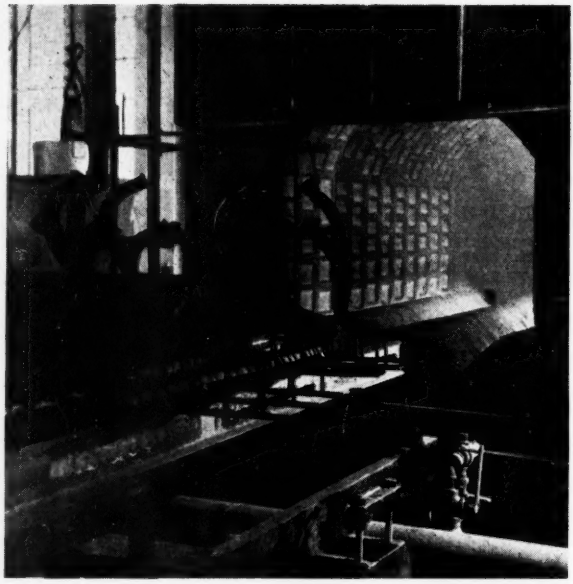
Electropolishing Provides a New Finish for Some Products

DR. CHARLES L. FAUST of Battelle Memorial Institute told the Cleveland Branch of the Electroplaters' Society at their regular November meeting that **electropolishing** is "not necessarily a new way to do an old job," but should be thought of as a new finish for many articles.

Designers and finishers may be in-



The durability of porcelain enamel finishes is illustrated by this porcelain enameled steel house. Built in 1933, it is said to be as good today as when constructed and maintenance expense has been insignificant.



This illustration shows a batch of exhaust stacks about to be rolled into a 1,600-degree gas-fired furnace for fusing the enamel on the stacks into the pores of the metal.

fluenced by the fact that heretofore any mirror-bright surface has been a wheel buffed or cold worked surface. Thereby, automatically, the planeness of a wheel buffed surface has been associated with great brilliance. Design and finishing that required brilliant surfaces had to take into account the mechanical polishing that was previously the only way to achieve the result. By electropolishing, unique and bright frosty to mirror brillance can be obtained. A sandblasted finish, which is normally a dead gray tone, can be dressed up to a brilliant new type finish that literally sparkles. Stainless steel castings can be brightened readily by electropolishing because the solution gets into the base of the pits, cleans them out and produces a bright surface. As a result, electropolished stainless steel castings have an unusual luster, even in the rough state, which makes them more attractive than unpolished castings and thereby enhances their sales value.

Many combinations of two-tone and relief effects are possible and quite practical to produce. Lacquers are used to "stop-off" areas or sections that are not to be anodically attacked. Use of these permits etched designs to be produced that are polished on the areas attacked.

The rating of decorative finishes is, in general, not subject to quantitative evaluation but is more a matter of personal opinion with people having the duty of passing on sales appeal. Such authorities have given high approval to electropolished finishes for those products on which final finish is of utmost importance, such as irons, toasters, percolators, and costume jewelry.

* * *

Automatic Spray Painting Often Is Warranted for Relatively Low Production

MUCH of the significant progress that has been made in recent years in the industrial application of paints, varnishes, lacquers, and kindred coating materials has been in the field of automatic spraying. Obviously, automatic painting equipment best fulfills its function when high production is involved, but there are occasions when even a relatively low production will warrant the use of this equipment as the most expeditious

FINISHING OVENS and SYSTEMS TO SUIT YOUR NEEDS
ENGINEERED AND INSTALLED BY DESPATCH

DRY-OFF OVENS
BONDERIZING
BAKING OVENS
SPRAY BOOTH
AIR CONDITION
CONVEYORS
FOR FINISHING
2 or 2000 units per day
Experienced attention to every detail is one of the reasons why Despatch has an unbroken record of successful installations.
Whether you need a small, fast-baking Despatch Batch Type Finish Baking Oven—or a complete Finishing System—you can be sure of prompt, courteous, experienced service every time!
For Dependability in Finishing Equipment It's DESPATCH

Prompt delivery of latest postwar models of Despatch Finish Baking Ovens is just *one* of the important, timely services now available to you!

Despatch, with the largest engineering staff in the industry and 44 years of specialized experience in building finishing equipment, will *plan, engineer and install your complete Finishing System* from A to Z.

Take advantage of this unusual service now! It assures you of ***correct* equipment properly installed ...faster, better baking... greater flexibility...easier operation... and lower finishing costs.** And you're spared weeks of needless delay and confusion.

Ask for quotations on: FINISH BAKING OVENS (all fuels; conveyor or batch models)... DRYERS... BONDERIZERS ...AIR CONDITIONERS... SPRAY BOOTHS... CONVEYORS

WRITE TODAY
FOR COMPLETE INFORMATION

DESPATCH OVEN CO.
619 SE. 8 St., Minneapolis 14

DESPATCH OVEN CO.
221 N. LaSalle, Chicago 1

Visit the DESPATCH booth A-320 at the METAL SHOW

Bring Your Finish Baking Problems With You

Experienced Despatch Engineers, specially qualified to discuss your finish baking needs, will gladly talk over *your* problems at Booth A-320.

So be sure to drop in for a cordial chat, either for a long-delayed "gab-fest", or to "talk shop", or both. Our Engineers will be eager to see you.

DESPATCH OVEN COMPANY MINNEAPOLIS 14 MINNESOTA, U.S.A.

method of finishing a product. Thus, in a production of as little as 100 pieces per hour, due to areas to be shielded from the coated surface, several operators might be employed in masking and preparing the object for spraying. In the case of the automatic painting machine, it is possible to design the work holders to serve the dual purpose

A worker is shown dipping a Taylor craft muffler in porcelain enamel ground coat. Thorough coverage of the corrosion-resistant coating is assured both inside and out.

of holding the piece to be coated and also shielding the non-coated surface.

One other noteworthy labor-saving factor in the case of low production is elimination of conveying the product from a spray booth to a drying or baking oven. In general, it is standard procedure to incorporate drying or baking facilities on the automatic machine. Some other advantages of automatic finishing are: savings in materials, uniformity of finish, minimum requirements for floor space, cleanliness in operating conditions, savings in labor, and accurate control of costs ("The Monthly Review," August, 1945).

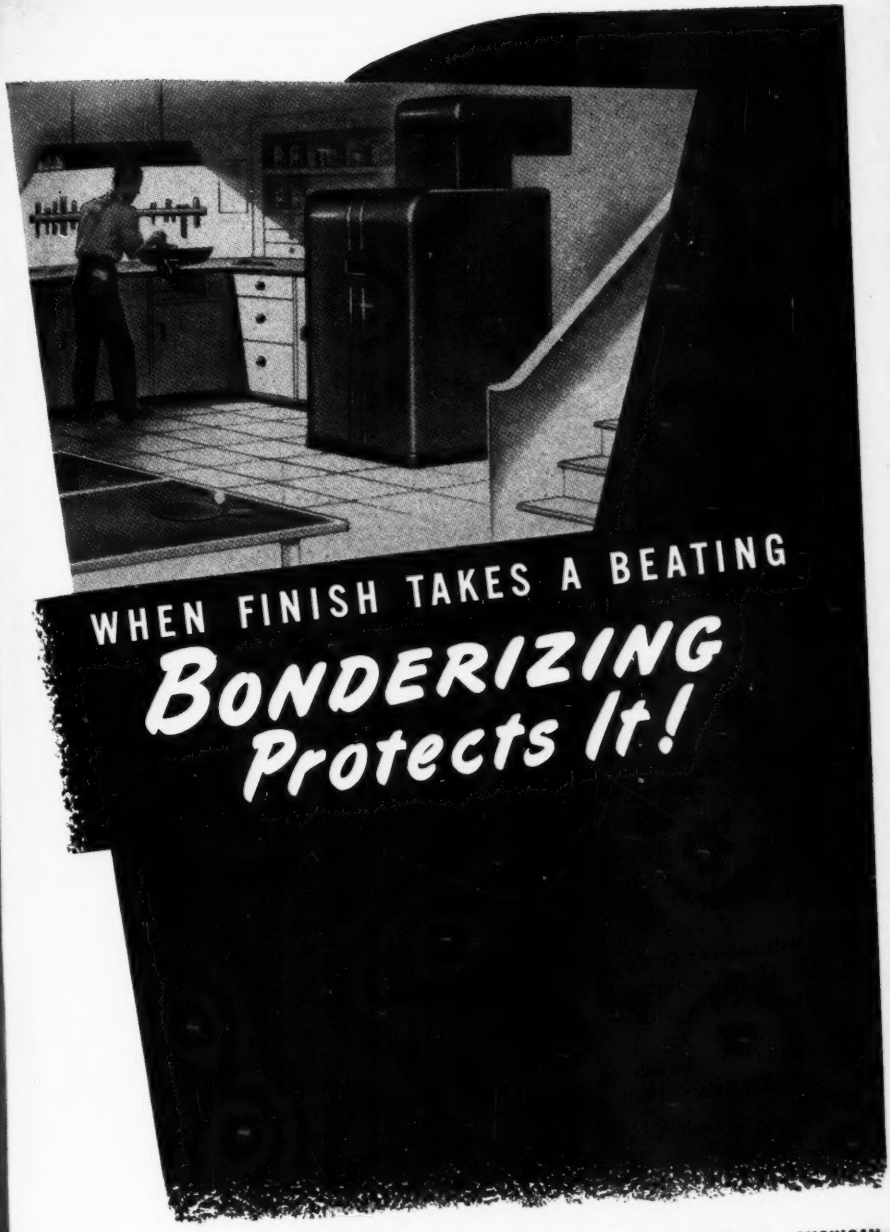
Automatic spray painting can go a long way in controlling the proper film thickness of coating to be applied to any given object. This will reduce the amount of wasted finishing material going up through the exhaust stacks of spray booths, as well as permit production of high standards of quality finish. There is a saving in labor by the elmination of traying and racking of the pieces to be sprayed and the time spent in conveying them to and from the manual spray booth. Also, if the article is to be force dryed or baked, the drying or baking equipment can be a part of the automatic machine, thus eliminating further handling of the work from spray booth to drying or baking oven. In many cases, the work can be unloaded automatically and in some instances automatic loading can be worked out with a further saving in labor.

For these reasons, at the present time there are automatic machines in operation with hourly production capacities ranging from 100 pieces per hour to 12,000 pieces per hour.

* * *

Finishes for Aluminum by Chemical Treatment

CHEMICAL surface treatments for aluminum and its alloys usually comprise simple immersions in aqueous solutions of inorganic chemical compounds. The primary function of the chemical treatments is to improve paint adherence, but they also do increase the resistance against ordinary atmospheric corrosion. Chemical treatments differ from anodizing in



PARKER RUST PROOF COMPANY, 2172 EAST MILWAUKEE AVENUE, DETROIT 11, MICHIGAN

that no electric current is required; also, the primary function of anodizing treatments is to improve corrosion resistance, however, they are beneficial to paint adherence.

Three different classifications of chemical treatments for aluminum surfaces have been described by W. L. Maucher and C. B. Gleason in the June 1945 issue of the "General Electric Review." These types in general use are: alkaline dichromate; chromic acid; and phosphate.

The **alkaline dichromate** treatment consists essentially of immersing previously cleaned aluminum in a solution containing 3 per cent of sodium carbonte and 0.1 per cent potassium or sodium dichromate for about 20 minutes at a temperature of 208 to 212 deg. F. and then sealing the coating by a 10 minute immersion in a 5 per cent solution of potassium or sodium dichromate at 180 to 190 deg. F. An absorbent porous oxide coating is first formed which is sealed and passivated by the 5 per cent dichromate bath.

The **chromic acid** treatment consists essentially of a 5 to 10 minute immersion of the previously cleaned aluminum in 5 per cent chromic acid at a temperature of 120 to 140 deg. F. The precleaning of the aluminum must be very thoroughly done since the chromic acid solution will not break through the thinnest of greasy films, such as fingermarks.

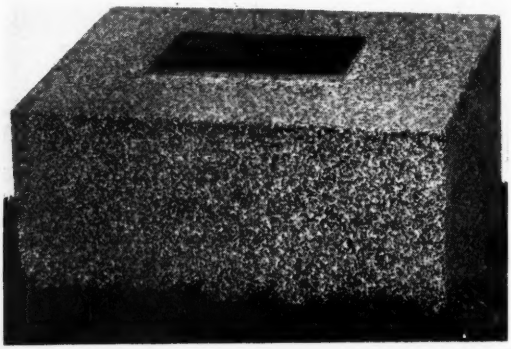
Phosphate methods of chemical treatment may involve the use of proprietary salts containing phosphates, or a solution containing 40 per cent butyl alcohol, 30 per cent isopropyl alcohol, 10 per cent phosphoric acid, and 20 per cent water by volume.

The improved corrosion resistance resulting from chromatizing probably is due to increased passivity of the surface. Phosphate treatments retard atmospheric corrosion because of the the resultant insoluble phosphate film. Phosphate finishes have been used without supplementary finishes in certain outdoor exposure applications with quite satisfactory results. In general, chemical treatment requires the application of subsequent coatings; one such coating sequence involves the application of a zinc chromate primer followed by an aluminum pigmented varnish of the bakelite type or its equivalent.

* * *

Certain Cold-rolled Steels May Require Special Pickle Prior to Finishing

FOR a long time it has been recognized that cold-worked steel articles, strip and sheet, present some special problems in their surface treatment after cold working and before such subsequent finishing treatments as electroplating, dip-tinning, galvanizing, enameling, and so on. Before any finishing process can be applied to the metal, a sur-

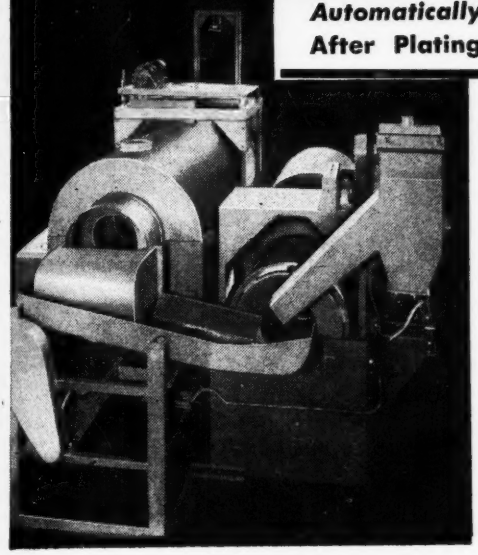


Porcelain enameled steel tomb "stones" like the one illustrated herewith are described as economical and durable.

Ransohoff EQUIPMENT

for the surface treatment of metals

Automatically Work Is Rinsed and Dried After Plating . . . WITHOUT SPOTTING



CONTINUOUS DRUM TYPE RINSING UNIT designed to *cold rinse, hot rinse and dry miscellaneous hardware after plating.*

One operator loads and unloads the work at the same place.

WORK is transferred rapidly from the discharge end of the rinsing unit into the sawdust drier by a vibrating feeding and draining pan. This pan is equipped with a hood to prevent the work drying before reaching the sawdust. Thus—no spotting of work, no manual handling.

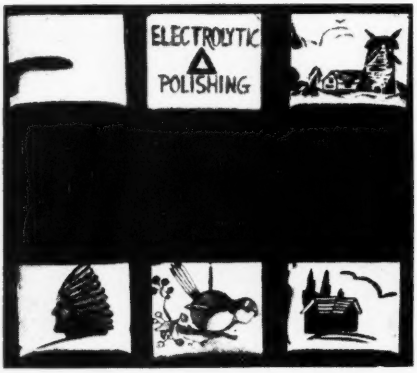
The sawdust drier automatically separates the sawdust from the work and the sawdust is dried over a heated drag conveyor while being returned to loading end.

Ransohoff Field Engineers will discuss your problems right in your plant.

N. Ransohoff, Inc.

face preparation is necessary to provide a metallurgically clean surface for the bonding of the protective coating which is to be applied. The usual form of this surface preparation is pickling in acid solutions.

With hot-worked metal, such as "hot pack" blackplate, there is no unusual problems in the pickle procedure, since, as a rule, it is done with the usual mineral acids, such as sulfuric



Two-tone decorative effect on stainless steel obtained by the use of stop-off lacquer prior to polishing
(Courtesy "Sheet Metal Industries")

or hydrochloric and under a variety of conditions, depending on circumstances. In contrast to this, cold-worked steels may not provide good results by straight pickling in these acids. Temper or pinch-rolled steel strips and drawn steel articles may produce irregular and poor surfaces when attempts are made to pickle and subsequently apply a protective coating such as an electroplate.

A mixed acid pickle treatment has recently been described ("Sheet Metal Industries," October 1945) which is reported to produce an improved surface for subsequent coating of such "difficult" steels by other metals, enamels, or other finishing materials. This special pickle bath consists of a mixture of 4 per cent nitric acid with 20 per cent sulfuric acid in water, and it is reported that the solution has been successfully used on extremely difficult steels, both for cold-reduced strip and for articles fabricated by deep drawing. Generally, a pickle time of four to six minutes is used. The pickle bath may be prepared as follows:

Nitric acid (Sp. Gr., 1.5).....4.25 lb.
Sulfuric acid (Sp. Gr., 1.84)..21.0 lb.
Water .....Balance up to 100 lb.

It was also noted that a trace of hydrochloric acid added to the bath increases the solubility of the ferric sulfate which is produced, particularly near the steel face, and thus improves the rate of pickling.

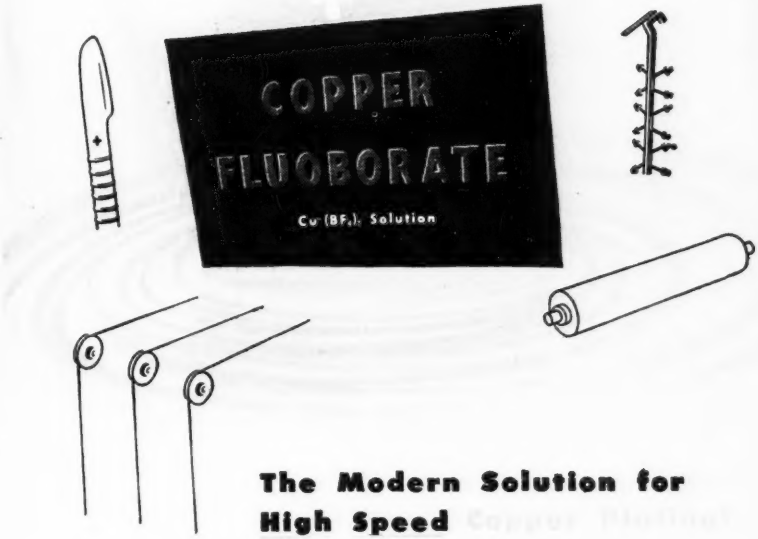
However, the complete pickle treatment is seldom carried out in this one bath. In the case of a pinch-rolled, cold-reduced, low-carbon steel, an immersion of six minutes in the nitrosulfuric pickle was used followed by a cold concentrated hydrochloric acid dip to remove a carbon smut which accumulated on the surface. A typical treatment for cold drawn work is to immerse in the nitrosulfuric pickle at room temperature for three to four minutes, transfer to a bath of 10 per cent sulfuric acid at 80 deg. C. for an additional five minutes, and after rinsing dip in concentrated hydrochloric acid for two minutes to remove smut from the surface. This sequence of pickle treatments was found to produce excellent results in finishing a series of very "difficult" steels. Metal-finishing production men having trouble with surface preparation of cold-worked steels prior to finishing may wish to investigate this mixed acid pickle bath.

* * *

The Silicones—Truly a New Type of Material with a Variety of Possibilities

WHAT will the new chemistry of oxygen-silicon linkages eventu-

General Chemical Presents Another New Research Achievement...



The Modern Solution for High Speed

General Chemical Fluorine Research leads again with another chemical of progress for the electroplating industry . . . Now, *Copper Fluoborate* . . . a concentrated solution that deposits copper at a higher rate than *any other known acid bath!*

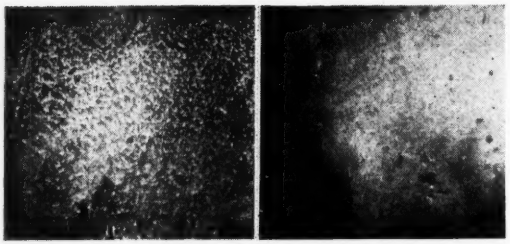
This superior plating chemical also produces semi-bright, fine grained and ductile coatings, as well as plates out heavy deposits when desired. It requires no addition agents and offers unusual simplicity of control.

Total its outstanding advantages. Consider what they can mean to you as an electrotyper, gravure printer, producer of composite copper-nickel coatings, or manufacturer of other copper-clad products that must be plated at fastest rate consistent with quality work. Then—try General's Copper Fluoborate for your plating!

For technical data . . . trial samples . . . or other helpful information on this product, contact General Chemical Company Fluorine Division, 40 Rector Street, New York 6, N. Y. or the nearest General Chemical Sales and Technical Service Office.

GENERAL CHEMICAL COMPANY
40 RECTOR STREET, NEW YORK 6, N. Y.

Sales and Technical Service Offices: Atlanta • Baltimore • Boston Bridgeport (Conn.) • Buffalo • Charlotte (N. C.) • Chicago • Cleveland Denver • Detroit • Houston • Kansas City • Los Angeles • Minneapolis New York • Philadelphia • Pittsburgh • Providence (R. I.) • San Francisco Seattle • St. Louis • Utica (N. Y.) • Wenatchee • Yakima (Wash.)
In Wisconsin: General Chemical Wisconsin Corp., Milwaukee, Wis.
In Canada: The Nichols Chemical Company, Limited
Montreal • Toronto • Vancouver



(Left) Surface view of tinned strip of cold-rolled low-carbon steel after "baking treatment" and pickling. (Right) Surface view of tinned strip of cold-rolled low-carbon steel after degreasing and "nitrosulfuric" acid pickling
(*Courtesy "Sheet Metal Industries"*)

ally mean to the finishing industry? The silicones, as these new compounds are called, are hailed as an outstanding achievement in a non-metallic engineering material—a really new type of material possessing many possibilities. Silicones are being produced by the Dow Corning Corp., Midland, Mich., and the General Electric Company.

An outstanding property of the silicone compounds is their excellent heat resistance; other noteworthy properties are water resistance, chemical inertness, resistance to softening at elevated temperatures and to hardening at low temperatures. A material possessing a combination of heat resistance, electrical resistance, and waterproofness naturally presents many possibilities in the coating industry.

Silicone coatings are reported to adhere tenaciously to glass, iron, steel, aluminum, and enameled articles. The coatings are applied as smooth white pastes by knifing, spreading, or roller coating, or by solution coating if thinned stocks are used. Dipping and spraying may also be used in the latter case ("Materials and Methods," October 1945). Coatings may be cured by heating to 475 deg. F. or higher if the film is less than 0.003 inch thick, whereas thicker coatings usually require longer time at lower temperatures.

A recent development of particular importance to the finishing industry is the use of silicone liquids as spatter release agents in welding operations. Thus, when highly polished surfaces of aluminum, stainless steel, nickel, and Monel metal must be welded, a coating of silicone liquid prevents spalls from the operation from marring the finish. The progressive production man of the finishing industry will want to keep an eye on the future possibilities presented by these new materials.

Unichrome Alkaline Copper Plating. A leaflet providing full details on the Unichrome Alkaline Copper Plating Process offered by United Chromium, Inc., 51 E. 42nd St., New York 17, N. Y., is now available from this firm free upon request.

"Safety" Sections. A four-page two-color folder published by the Newark Brush Co., Michigan Ave., Kenilworth, N. J., contains illustrated, descriptive, and complete tabular data on the "Safety" Steel Wire Sections and Tampico Sections offered by this firm for use in burring and similar operations. Copy free upon request.

Newark Brushes. The Newark Brush Co., Michigan Ave., Kenilworth, N. J., has prepared a series of bulletins which illustrates and describes respectively Newark Custom-Built "Safety" Brushes; Type "8" Scratch Brushes; Type "5" Scratch Brushes; No. "606" Wire Brushes which are said to be excellent for removing rust, cleaning castings, or removing scale from any metal parts; and No. "600" Wire Brushes for cutting or roughing operations. Copies of the bulletins are available free upon request.

ticklish work

Getting metals clean is often a ticklish job, too. Yet it's a mighty important one—especially in these busy days when new metal cleaning problems are developing in reconversion work.

That's why so many progressive plants depend on Wyandotte Metal Cleaners. There's one of these *specialized* products to meet almost any metal-cleaning need—for cleaning after machining and prior to plating, painting, lacquering, anodizing, spot-welding.

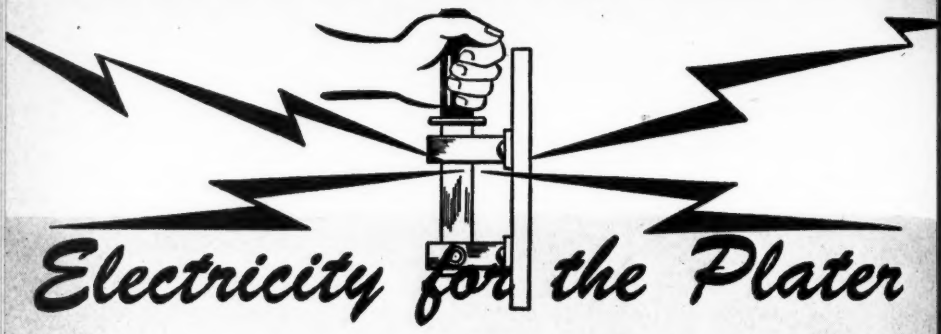
The Wyandotte Representative is ready to give you specialized help, also, on your metal-cleaning problems. It will pay you to consult him—you'll save time, labor and money.

Wyandotte

REG. U. S. PAT. OFF.

WYANDOTTE CHEMICALS CORPORATION • J. B. FORD DIVISION

WYANDOTTE, MICHIGAN • *SERVICE REPRESENTATIVES IN 88 CITIES*



Electricity for the Plater

D. A. COTTON

Part VII

A VERY convenient form of portable meter for use around a plating department is the "Tong-Test" ammeter made by the Columbia Electric Manufacturing Company. Figure 33 shows two views of this meter reproduced from photographs furnished through the courtesy of the Martindale Electric Company, Cleveland, Ohio, seller of the instrument.

It often happens that a plater wishes to determine current density on a certain piece or to calculate efficiency of his plating bath. In order to do this, he must know the current flowing to that particular piece and with the Tong-Test meter it is possible to take individual readings on each rack in a tank load. These meters may be used on either direct current or alternating current circuits.

The wattmeter retains the moving coil circuit essentially like that of the voltmeter. However, the permanent magnet is replaced by a fixed heavy series winding through which all or a definite portion of the load current passes. (Figure 34 affords a diagrammatic idea of the wattmeter circuit.) Thus, we have the series winding furnishing a magnetic field which is proportional to the load current **I** and the movable coil with

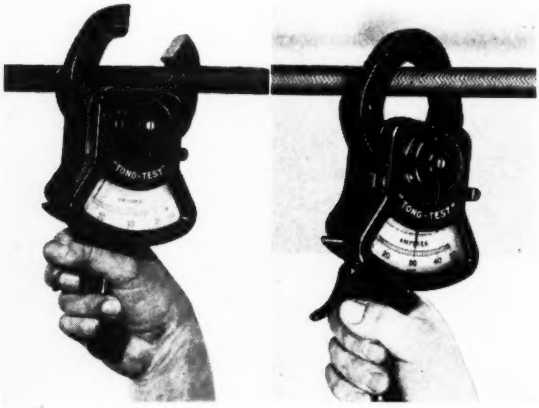


Fig. 33—"Tong-Test" ammeter

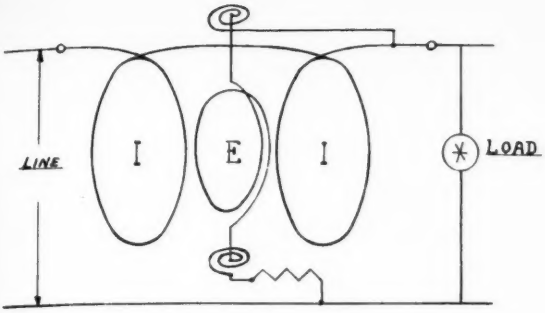


Fig. 34—Indicating wattmeter circuit

magnetic poles proportional to the line voltage **E.** The result is a deflection of the movable coil proportional to the product of **E** and **I** or to watts.

The meters thus far described are known as indicating meters; that is, they merely read values at the time of observation. In certain types of plating, such as silver plating, where it is very essential that the specified amount of metal be deposited and plating any more would represent loss to the plater, the installation of ampere-hour meters is desirable. These instruments measure actual quality of current in coulombs, and, since the weight of metal deposited is proportional to coulombs, the meters can be used to control the amount of plate. By proper calibration of the scales, they can be made to indicate ampere-hours instead of ampere-seconds or coulombs.

Meters which have to register the time element, such as the ampere-hour meter or the watt-hour meter, are known as integrating meters and are usually of the motor type. In ampere-hour meters of the motor type, instead of the movable coil which simply deflects in the indicating type, we have a small commutator motor which rotates when a very small voltage (one or two volts) is impressed at its brushes. The armature has no iron in its circuit and is connected to the terminals of a shunt which carries the load current. The motor, therefore, runs on the drop in voltage across the shunt, a hookup very similar to that shown for the shunt ammeter at (b) in Fig. 29. The magnetic field is furnished by a permanent magnet (see Fig. 35). On one end of the motor shaft is a worm gear which meshes with a train of gears similar to that on a gas meter.

The watt-hour meter differs from the ampere-hour meter in that the permanent magnet is replaced by fixed field coils through which the load current or a definite portion of it passes. The armature winding is connected across the line with a high resistance in series. Sometimes a shunt winding is added to the field to compensate for friction of the moving parts. The armature shaft also carries a thin disc of aluminum or copper which rotates between the poles of

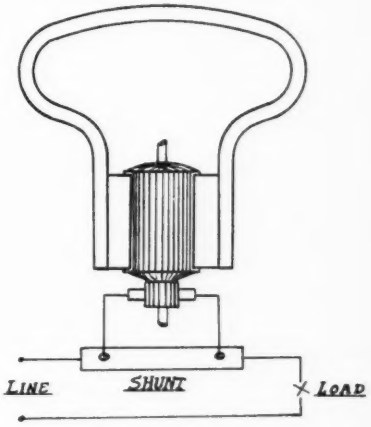


Fig. 35—Ampere-hour meter circuit

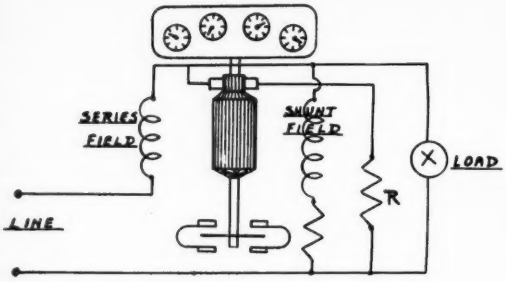


Fig. 36—Integrating wattmeter circuit

permanent magnets. The eddy currents induced in the disc produce a retarding torque or drag which has the same effect as the spiral springs in the indicating type meters previously described. Figure 36 comprises a diagrammatic sketch of the integrating watt-hour meter circuit.

The discussion of electric meters has dealt mainly with the switchboard type because that is the kind usually installed in plating rooms. However, portable meters are very handy to have for special uses. As previously mentioned, the Tong-Test ammeter is very useful in cases where it may be desired to measure the current flowing through a part or rack in a plating bath or through any conductor in the circuit. The advantage of this meter is that the current flowing through a conductor may be read, without disconnecting parts of the circuit and inserting an ammeter or shunt, simply by closing the movable jaws of the Tong-Test meter around the conductor.

Of course, it is also possible to use the usual type of portable meter to measure current flowing to a rack, as shown in Fig 37. An ammeter with two clamp leads is connected from the bus bar to a place on the rack below the point of contact between the rack and bar. The ammeter is then in parallel with part of the rack and some current will flow through the meter. However, as soon as the rack **A** is lifted from the bus bar, all the current flowing to the rack will be registered on the meter.

A portable voltmeter with two or three scales, say 150, 15, and 3, is also very useful. Some of its applications are as follows:

1. To measure resistance of some part of a circuit such as for instance, a resistance unit.
2. To measure drop across a connection between parts of a line.
3. To measure insulation resistance of a motor or generator winding.

Figure 38 serves to illustrate the first two applications.

1. It may be desired to check the resistance of a rheostat in order to make a change in the current to a plating tank. Suppose a current of 100 amperes is flowing as shown on the ammeter. Placing the voltmeter leads across the terminals of the rheostat, the meter indicates 2 volts drop. Then, by Ohm's law, $R = \frac{E}{I}$

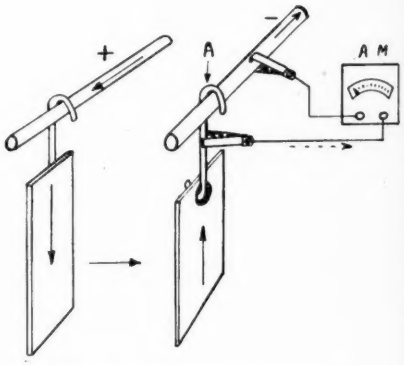
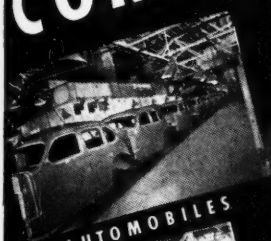
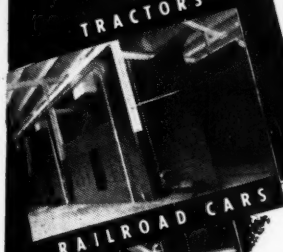


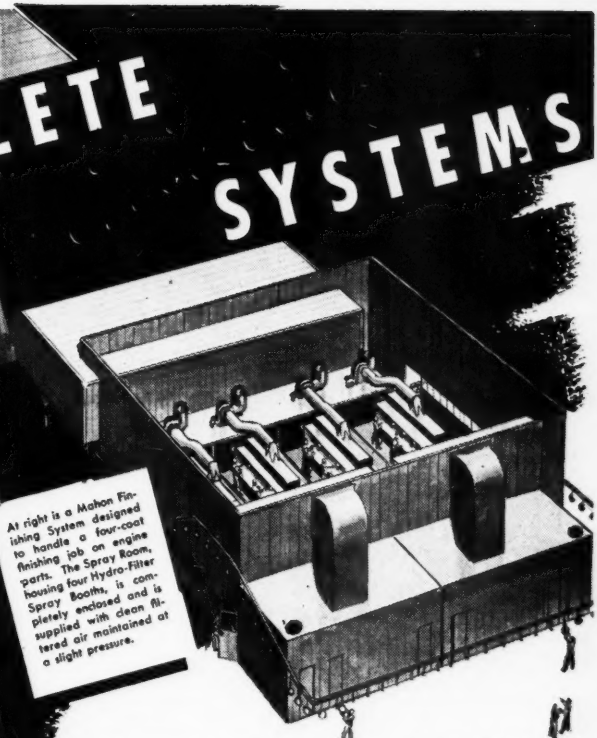
Fig. 37—Current measurement with portable meter

COMPLETE SYSTEMS





REFRIGERATORS
Ironers, Washing Machines, Freezers, Stoves, Metal Furniture, Plumbing Ware, Radios, Airplanes and many other Products.



At right is a Mahon Finishing System designed to handle a four-coat finishing job on engine parts. The Spray Room, housing four Hydro-Filter Spray Booths, is completely enclosed and is supplied with clean filtered air maintained at a slight pressure.

. . . Planned and engineered to do YOUR FINISHING JOB with utmost Efficiency

No matter what your finishing requirements may be . . . no matter what shape or size your product may be, the Mahon organization is prepared to produce for you the most efficient installation obtainable. This statement is supported by over twenty-five years of pioneering in this field, involving research, development and coordination of machines and methods, and is backed up by hundreds of installations all over the world—installations that are now serving every industry where finishing constitutes a major production operation. The resultant wealth of technical knowledge and practical know-how that go into the planning and engineering of each Mahon installation is not available to you elsewhere . . . consultation with Mahon engineers will not place you under obligation.

Address Correspondence to INDUSTRIAL EQUIPMENT DIVISION

THE R. C. MAHON COMPANY

Home Office and Plant, Detroit 11, Mich. • Western Sales Division, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems including: Metal Cleaning Machines, Rust-Proofing Machines, Dry-off Ovens, Hydro-Filter Spray Booths, Filtered Air Supply Units, and Drying and Baking Ovens. Also Paint Sludge Reclaiming Units, patented Hydro-Foam Dust Collecting Systems, and many other Units of Special Production Equipment.

MAHON

$= \frac{2}{100}$ or 0.02 ohm. In the same way, all the various sections of the whole circuit may be checked.

2. Some part of a circuit may be

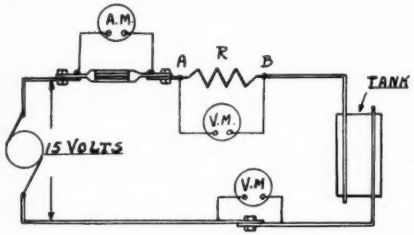


Fig. 38—Voltage drop tests with portable meter

suspected of being a source of excessive drop in voltage. It may be a joint where two sections of a bus bar are clamped together or perhaps a terminal is soldered onto a heavy cable. The presence of such a defect will probably be indicated by the joint becoming overheated when current is flowing. Connect a voltmeter across the joint and tap on the connection with some light object. If the joint is poor, the voltmeter needle will probably jump back and forth. If good, the needle will be steady and will show only a very small deflection.

It is to be noted that in using a voltmeter with several ranges, the investigation should be started using a range high enough to read full line voltage. It should not be forgotten that, as soon as a circuit is opened, the potential between the open ends rises to full line voltage. For instance, referring to Fig. 38, if the circuit be opened at either **A** or **B** with the voltmeter still connected, the voltage on the meter will be 15 instead of 2. If the low 3-volt range were being used, it is obvious that the sudden application of 15 volts to the 3-volt scale would probably damage the meter, at least by badly bending the needle, if not burning out the winding.

3. If the windings of an electric motor or generator are suspected of being grounded or partially so, it is sometimes desirable to check the insulation resistance of the windings. The method for making this test is shown in Fig. 39. With the machine disconnected from the line, a voltmeter wired as shown in the diagram is connected from one of the brushes to the frame of the machine. If the windings have high insulation resistance, no readable deflection of the voltmeter will occur. If a slight ground is present somewhere, a small deflection may be noted, and, if the winding of the field or armature is grounded, the voltmeter will read full line voltage or nearly so, according to the severity of the ground.

The insulation resistance may be calculated from the formula $R = \frac{E - e}{e} \cdot r$ where **R** is insulation resistance, **E** is line voltage, **e** is the reading obtained with the voltmeter in series as shown in Fig. 39, and **r** is the resistance of the voltmeter winding.

Assume that a reading of 2 volts was obtained using the 150-volt scale on the voltmeter and that the line voltage was indicated as 125 volts. A Wes-

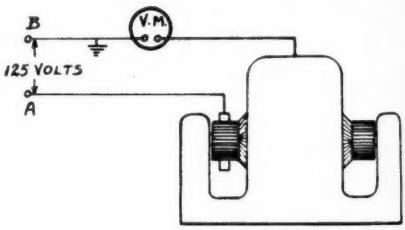
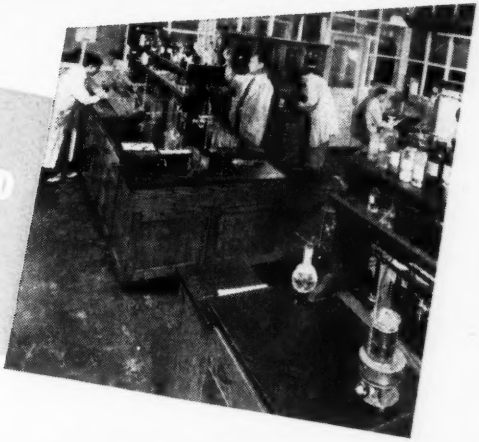


Fig. 39—Insulation resistance measurement

ton portable voltmeter will have about 15,000 ohms in the 150-volt winding (as shown on the card inside the cover of the meter), therefore, the insulation

Where SCIENCE AND PLATING PRACTICE UNITE



The Udylite Laboratories are common ground for scientific electrochemistry and practical electroplating practice. Here an organized program of research is continually discovering new techniques to improve electroplating processes and whittle down their costs—

Here the current problems of the individual plating shop are worked out for its management—

Here all the chemicals and other materials sold by Udylite to platers are tested to make sure of their quality—

Udylite could sell chemicals, supplies, machines, etc., without going to the expense of providing and maintaining such a complete research and modern laboratory service, but that is a part of the cost of leadership.

Udylite Products

than these bought elsewhere

THE Udylite CORPORATION
1651 EAST GRAND BOULEVARD
DETROIT 11, MICHIGAN
REPRESENTATIVES IN ALL PRINCIPAL CITIES

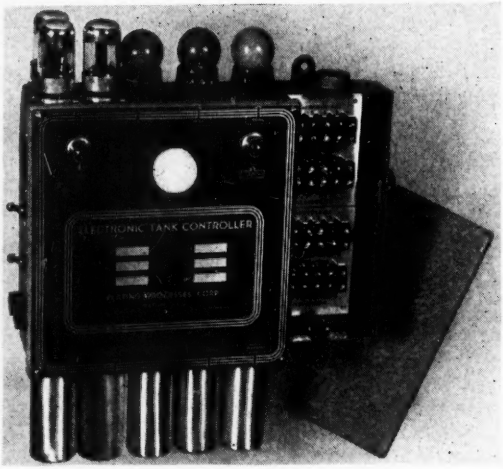


Fig. 40—Electronic tank controller

resistance of the machine will be $R = \frac{125 - 2}{2} \times 15{,}000 = 922{,}500$ ohms or 0.9225 megohm.

If a power line is used, one side of which is grounded, the high side should be at **A** and the grounded side **B** connected to the machine frame.

Another electrical instrument that is a very useful adjunct to a plating department is the electronic tank controller, called by its manufacturer the "Automatic Tank Watchman." Figure 40 comprises a photograph of an electronic tank controller furnished through the courtesy of the Plating Processes Corporation, Holyoke, Mass., maker of the instrument. This unit controls both the high and low level of solutions in tanks, detects leaks in tanks or tank linings, and, when used with proper thermal detecting elements, maintains the temperature of the solution within desired limits.

In the field of hard chromium plating, control units such as these are especially useful, since it is possible without personal supervision to plate parts all night when they require heavy build-up, thus saving valuable day time.

The next article in the series will discuss Faraday's laws, knowledge of which is indispensable to a well-informed plater.

Leiman Sand Blast Machines. Leiman Bros., Inc., 146-181 Christie St., Newark 5, N. J., now has available a four-page bulletin which provides illustrated, descriptive, and tabular information on a complete line of continuous sand feed cabinet and hose type machines for the cleaning and matte finishing of metals, plastics, and other materials, and for removing hardening scale. Copy of Bulletin 102945 free upon request.

Howard Mills, especially designed for the deburring of fragile parts, are covered in a catalog published by the Howard Engineering and Manufacturing Co., 2236 Buck St., Cincinnati 14, Ohio. Copy free upon request.

Metal Parts Washing Machines. A 28-page book descriptive of a line of metal parts washing machines engineered by G. S. Blakeslee and Co., Chicago 50, Ill., is now being offered by this firm. Copy free upon request.

Nickel Alloys. The International Nickel Co., Inc., 67 Wall St., New York 5, N. Y., now has available a revised List "A" of current publications on nickel alloy steels, nickel cast irons, nickel brasses and bronzes, and nickel plating. Publications offered cover the production, fabrication, properties, and uses of nickel alloys for industrial applications, and the production, properties, and use of nickel electrodeposits.

• Thoroughly removes grease and oil from metal

• Thoroughly removes grease and oil from metal parts of any size or shape, often in less than one minute

YOU CAN CUT COSTS and speed production with quick, efficient, safe Vapor Degreasing. This economical cleaning method removes all traces of grease and oil from metal parts. It reaches deep draws, holes and almost inaccessible places—leaves parts clean, warm, and dry—ready for the next fabricating or finishing step. The process uses compact equipment and small quantities of pure Trichlorethylene or Perchlorethylene solvent, easily recoverable for re-use.

Clip the coupon below for your free copy of our fact-filled book, "Metal Degreasing—Standard Practices." Fully illustrated.

E. I. DU PONT DE NEMOURS & CO. (INC.)
Electrochemicals Department
Wilmington 98, Delaware

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.) FF-2
Electrochemicals Department
Wilmington 98, Delaware

Please send me my copy of "METAL DEGREASING—STANDARD PRACTICES."

Name _____ Position _____

Firm _____

Address _____

Spray-Booth Lighting

Tunnel-type booth with 40-watt fluorescent units

By W. H. KAHLER*
Lighting Engineer
Westinghouse Electric Corporation
Cleveland, Ohio

ALMOST every manufacturing plant has some sort of paint spray booth and few are properly illuminated. Lighting a spray booth is one of those annoying problems to a plant engineer and he will welcome authoritative assistance that will help him arrive at a satisfactory solution.

Spray-booth lighting involves three fundamental requirements:

1. To make a fire-safe installation.
2. To provide adequate lighting.
3. To make servicing easy and to minimize the cleaning problem.

In recent years, lighting engineers have worked extensively with spray booth manufacturers in an effort to solve all of these problems with practical equipment and at minimum cost. The experience thus obtained is summarized in this article.

The lighting system will not be a fire hazard if the following precautions are observed:

1. Approved vapor-tight luminaires are used.
2. Lighting equipment is mounted flush in the ceilings or walls of spray booths; or light is directed into the spray booth from the front.
3. The booth is well ventilated by approved means.
4. The installation is inspected by a local inspection authority. Most inspection departments will approve vapor-tight equipment if installed in the manner outlined above.

If white is applied over a dark surface, 10 to 20 foot candles of illumi-

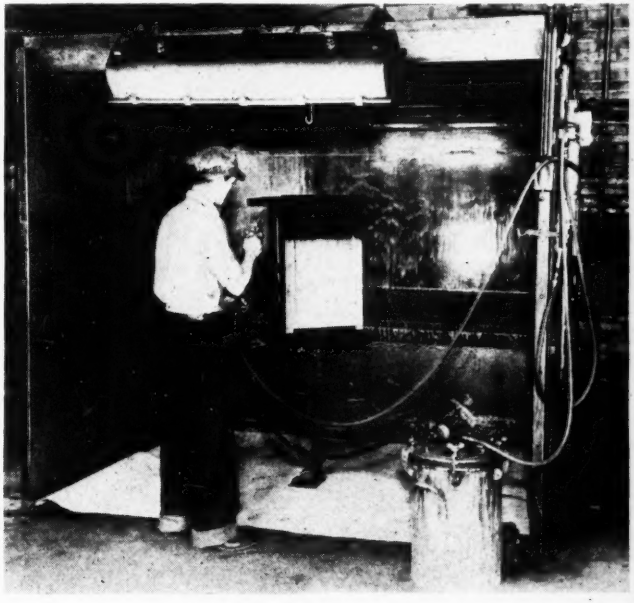
*The author is indebted to the DeVilbiss Company, Toledo, Ohio, for photographs and much of the detailed information used in preparing this article.

nation are satisfactory. If a dark finish is applied over a dark surface, at least 50 foot candles of illumination are required to afford sufficient contrast between the finished and unfinished areas. However, most booths must be satisfactory for both high and low contrast painting, so the higher level is recommended. All harsh shadows should be eliminated by properly locating and directing the luminaires. Flourescent units are ideal for this purpose.

Flourescent lighting has become a principal type demanded for spray booths for four main reasons; namely, (1) high foot candles can be obtained at minimum wattage, (2) minimum radiant heat improves worker's comfort, (3) long source minimizes shadows, and (4) low brightness reduces direct and reflected glare.

For spray booths, vapor-tight luminaires with heat tempered ¼-inch thick glass covers should be specified. Either two or three 40-watt lamp units can be used, however, the latter is recommended for most cases in order to obtain maximum illumination with a minimum number of units.

Fluorescent luminaires can be installed in several different ways, depending upon conditions. The illumination in-service depends upon the frequency of cleaning. Paint residue can be easily removed with a cloth if glass panels are coated with a light petroleum jelly. Daily cleaning is recommended.



Small cabinet - type booth having one vapor-tight fluorescent fixture mounted at the front

---

"Surface Coating with Flock" is the title of an illustrated color book now being distributed by the Rayon Processing Company of Rhode Island, Inc., 65 Tremont St., Central Falls, R. I. Copy free upon request.

"Coolants for Abrasive Belts" is the title of a four-page illustrated bulletin now being distributed by the Clover Manufacturing Co., Norwalk, Conn. Written by E. B. Gallaher, the descriptive matter contained therein is concerned with the use of glue-bonded belts with an oil coolant versus "waterproof" belts with a water coolant. Copy free upon request.

Urea in Acid Copper Plating Solutions

By
WALTER BRENNER*
and
DR. C. B. F. YOUNG**

THE purpose of this paper is to extend our knowledge of the effects and behavior of certain classes of substances, commonly known as addition agents, in acid copper plating solutions. In this specific instance, we are particularly interested in the organic type containing NH_2 and C = O groups. This paper is the second in a series which began with an investigation of the remarkable effects produced on the physical characterisics of the cathode deposits by the addition of very small amounts of thiourea to the copper sulfate plating bath[1].

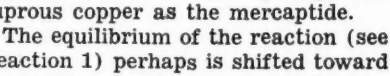
As will be recalled, the addition of an aqueous solution of thiourea to the conventional acid copper plating bath produces bright and hard deposits. Concentrations varying from 0.01 - 0.03 gram/liter were recommended for best results. The deposits produced were not too brittle. Greater concentrations were found to result in greatly increased brittleness of the cathode deposits. Finally, the loss of brightness occurred when concentrations of thiourea beyond 0.2 - 0.3 gram/liter were used.

Of all the other variables investigated, the effect of temperature proved to be the next of importance. Gradual loss of brightness was found to result as temperatures were increased beyond 80 deg. F. At 110 - 120 deg F. almost all of the effects obtained by the addition of thiourea were lost.

It was found that solid thiourea could not be added directly to the bath successfully because very little of it went into solution; also, that which did dissolve soon united with components of the bath to produce a voluminous white precipitate which settled to the bottom of the tank. When aqueous solutions of thiourea were added to the bath, this voluminous white preciptate was formed but could be redissolved with vigorous stirring. However, upon standing, it was slowly reprecipitated from the bath. It was suggested that probably the tautomeric imide precipitated cuprous copper as the mercaptide.

The equilibrium of the reaction (see Reaction 1) perhaps is shifted toward the right upon prolonged standing by an increase in temperature, etc., thus limiting the effective life of the addition agent.

Reaction 1



Tautomeric

In view of the considerable commer-

*Electrochemist, Columbia Recording Corp., New York, N. Y.
**Consultant, Head, Institute of Electrochemistry and Metallurgy, New York City.

cial interest in the development of a suitable addition agent for the production of bright ductile deposits from a copper sulfate electrolyte, these properties of thiourea assume added significance. The chief objections to its use are its brittleness, a certain difficulty in control due to the very small quantities required, the low temperatures necessary to obtain bright cathode deposits, and the precipitate formed by the addition agent reacting with the bath. These low bath temperatures (70-75 deg. F.) may necessitate the introduction of cooling oils, etc., particularly if a high speed plating process is to be used.

The possibility of obtaining bright, "non-brittle" deposits by suitably modifying the structure of thiourea was considered worthy of further investigation. Perhaps it was possible to substitute a group for one present in the compound and still obtain bright, non-brittle deposits at temperatures of 75-160 deg. F. and also prevent the formation of a precipitate in the bath. Thus, the good properties could be held while the bad properties might be overcome.

After investigating the relationship of the thiourea, it appeared that the C = S group was the active ingredient. It will be recalled the authors pointed out in the previous paper[1] that perhaps a mercaptide was responsible for the percipitate. Thus, by eliminating the C = S group, perhaps the bad properties could be overcome. After due consideration, it was decided to substitute a C = O for the C = S, thus using urea instead of thiourea. Sulfur and oxygen are in the same family in the Periodic system.

The effect of the addition of urea to an acid copper sulfate plating bath on the physical characteristics of the cathode deposit was now studied with the objective of producing a bright ductile deposit from the commercial bath at higher temperatures than those practicable for thiourea.

Procedure

The procedure used for this investigation was very similar to that described previously in connection with the thiourea study. A conventional acid copper plating solution was made up in a hard rubber tank of ten-gallon capacity:

$CuSO_4.5H_2O$ .....31.2 oz./gallon
H_2SO_4 (sp. gr. 1.84) ..5.98 oz./gallon

This solution was filtered twice to remove any suspended matter. Urea was added to this solution, both as a solid and in the form of an aqueous solution, in previously carefully determined quantities weighed by means of an analytical balance. An electrolytically pure copper anode was suspended from a copper rod and immersed completely in the plating bath. Similar suitable connections were made for the cathode plates of predetermined area used. Current was obtained from a G-E copper oxide rectifier complete with a suitable voltage control device, thereby allowing control of both voltage and current.

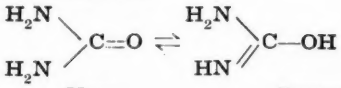
After a suitable plating period, the cathodes were taken out of the bath and the deposits examined for brightness, smoothness, ductility, adherence, etc. A ductile deposit was defined as one of about 0.001 inch thickness which, when stripped from the cathode, could be folded and creased without fracture. The effects of varying the concentration of urea, acidity, current density, temperature, etc., on the physical characteristics of the deposit were studied and all pertinent data recorded. A minimum of two runs was made whenever a variable was changed. The standard bath was frequently renewed and tested periodically to ensure its purity and uniformity.[1]

A one-gallon glass jar, thoroughly cleaned, was substituted for the rub-

ber tank for those experiments requiring relatively large quantities of urea in order to save chemicals. Electrical connections, etc., were all similar to those described above. The cathode plates used had an area one tenth of that of the plates previously used in order to simplify current readings and current density calculations.

Experimental

C. P. urea NH_2CONH_2 (MW.60.06) was obtained and recrystallized twice before use. This compound was first made synthetically by Wohler in 1828 by evaporating ammonium cyanate, a reaction which is generally considered to mark the beginning of what is now known as organic chemistry; at the present time, it is manufactured commercially by direct synthesis from carbon dioxide and ammonia. The formula appears as shown but the distance between the C and the N is considerable shorter than would be expected from the formula, a fact that supports Werners' formulation of isourea which explains many otherwise seemingly strange reactions of the compound.[2]



Urea Isourea

The material crystallizes in colorless tetragonal prisms with a melting point of 132.7 deg. C. The density has been found to be 1.335 grams/ml. At 5 deg. C., 78 grams of urea are soluble in 100 ml. of water, while at 25 deg. C., its solubility has increased to 119.3 grams per 100 ml. water. The compound is soluble in methyl and ethyl alcohol while its solubility in ether, etc., is very slight. Being a weak base, it is capable of forming salts with some strong acids. Aqueous solutions of urea are neutral.

When solid urea is added to the conventional copper sulfate bath, no precipitate is formed as in the case of thiourea. Neither does any change occur upon prolonged standing. All this leads to the conclusion that the above mentioned reaction of thiourea resulting in the formation of an insoluble mercaptide does not take place with this compound. It was found that raising the temperature above 130 deg. F. decreased the effect of the addition agent greatly, probably due to urea's hydrolysis. This will be discussed more fully below. Because of greater convenience, aqueous solutions of urea were added to the plating solution in the subsequent experiments.

I. Effect of varying the concentration of urea in the bath. Aqueous solutions of urea added to the "standard" copper sulfate plating bath to give concentrations varying from 0.01 to 30 grams/liter of urea and the physical properties of the cathode deposits

PLASTEX
(Trade Mark Reg.)
COLOR COAT
A BEAUTIFUL PROTECTIVE FINISH
For ALUMINUM, MAGNESIUM
ZINC, BRASS, STEEL

- Adheres To Any Surface
- TOUGH and FLEXIBLE
- WATERPROOF
- Resists Most ACID, ALKALI or BRINE SOLUTIONS or VAPORS
- Unaffected by ALCOHOL, LUBRICATING OILS or GASOLINE

Supplied Clear and in 19 Colors.
Write for Color Card Today.

STEEL PROTECTION & CHEMICAL CO., INC.
Mooresville 3, Indiana

Get the Combined Advantages of Radiant and Convected Heat

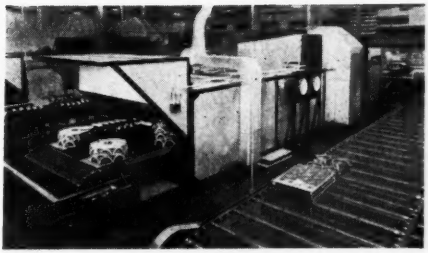
by BAKING FINISHES in GEHNRICH OVENS

For coated metal surfaces which can be rapidly dried by infra-red radiation it has been found that the addition of air convection provides more uniform baking or drying conditions and better removal of fumes. In Gehnrich Ovens the advantages of heat radiation and convection have long been combined to give the desired results.

But—let's be frank: radiant heating alone is *not* the answer to every finish baking problem. For many irregularly shaped products, closely stacked loads, etc., recirculation heating alone proves better and more economical.

Gehnrich Oven Engineering fits the oven to process the job. We have no pet heating systems to exploit. We design necessary cleaning, protective finishing and handling systems to fit the needs of the finishing process.

Let Catalog No. 114 give you evidence of a world of oven processing experience.



Horizontal belt, continuous conveyor oven, electrically heated with air recirculation for drying painted castings.

Two large continuous conveyor ovens with radiant heat and air circulation for baking enamel on license plates.

GEHNRICH OVEN DIVISION

W. S. ROCKWELL COMPANY • 230 ELIOT STREET • FAIRFIELD, CONN.

Batch or Conveyor Ovens for Baking Coatings & Finishes

Cleaning • Rustproofing • Drying • Finishing Equipment

were studied. The bath temperature varied between 70 and 80 deg. F. during this series of runs. It was found that the temperature variation did not affect the nature of the deposits in any noticeable degree. Agitation was helpful in producing smoother and more uniform deposits, especially at higher current densities. The solution was frequently tested and filtered for obvious reasons. Results obtained are shown below in tabular form.

Concentration of Urea in Bath in Gm./L.	Current Density in A.S.F.	Deposit
0	15 25 50	Pink, smooth, ductile, fine grained, adherent, easy to strip; as C.D. is increased to 45 and/or plating time prolonged beyond 0.003 inch, there is a gradual loss of smoothness, etc., in spite of vigorous agitation.
0.01 to 0.04	25 45	Smoother and more finely grained deposit than above, ductile, easy to strip, "whiter" shade of copper deposit with some brightness, especially at C.D. up to 45 and thicknesses up to 0.002 inch.
0.06 to 0.20	25 45 55	Very smooth, uniform and fine grained deposit, ductile, easy to strip; at higher C.D., semi-bright plates may be obtained from 0.0015 to 0.002 inch with very vigorous agitation; whiter shade of copper.
0.25 to 1.2	25 45	Some decrease in smoothness, less fine grained (somewhat); some brightness of deposits, especially at higher C.D.; ductile, adherent, redder shade of copper noticeable.
1.5 to 30.0	25 45	Color of deposit changes slowly to salmon as urea content in bath increases, otherwise not much change from above; ductile, adherent, smooth and fairly fine grained (better than straight $CuSO_4$ sol.) etc.

It can be concluded with reference to the above recorded results that the use of urea as an addition agent in acid copper sulfate plating solutions is beneficial to the cathode deposits. Increased smoothness and finer grain size are realized without any sacrifice of ductility or adherence. Concentrations of urea ranging from 0.06 - 1.2 grams/liter are recommended for best results. However, the brightness of the deposits obtained is in no way comparable with that produced by the use of thiourea. Substitution of a C = O for the C = S group, the only change effected in the molecule, is therefore seen to result in two very significant changes in the physical characteristics of the cathode plates:

1. Ductility is maintained even when the concentration of the urea in the bath is increased to 30 grams/liter. This contrasts very sharply with the extreme brittleness of the deposits obtained by the use of thiourea in concentrations as low as 0.08 to 0.1 gram/liter.

2. Most of the brightening power associated with the use of thiourea in proper concentrations has disappeared. Deposits obtained are well-colored, even semi-bright in some instances, but never approach the brightness and luster of deposits obtained by the addition of the thio-compound.

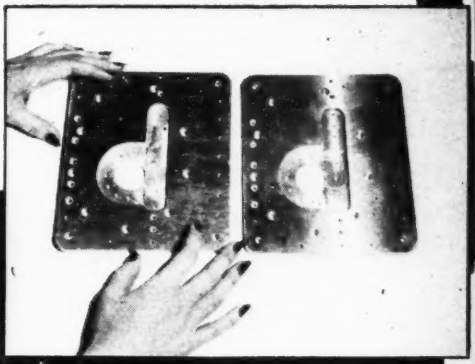
As plating time is increased at any given current density, the smoothness of the plates gradually decreases. This increase in grain size is noticeable when plating to 0.003-0.004 inch thickness. This phenomenon is in no way unusual and occurs in all plating operations to some degree. Since

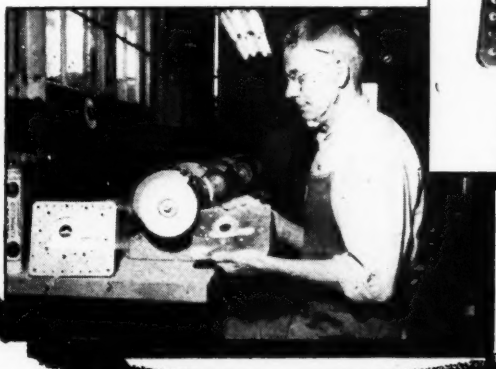
LEA Shows the Way

THE PIECES. . . *cast aluminum plates*

THE PLACE . . .

Pacific Gear Plant
Western Gear Works
Vernon, California





Here is a scene [illegible] countless plants where finishing operations are carried on. A bench, a wheel, Lea Compound or Learok and a skilled workman deburring, polishing or buffing a piece by a method devised with the help of the Lea Technical Staff.

Yes, the proper finishing of metals and non-metals calls for a thorough knowledge of the behavior of materials during the various finishing operations. It calls for the broadest experience in finishing . . . in burring, in polishing, in buffing.

It is here that LEA fits into the picture. We have the "greaseless" and "no-free-grease" compositions—lots of different grades, but it is on our technical service and sound recommendations that we have built and are maintaining our reputation as "Authorities on Finishing Operations."

THE LEA MANUFACTURING CO.

Waterbury 86, Connecticut

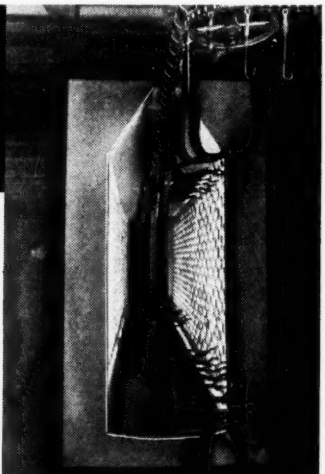
Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods and Compositions

most common plating applications seldom require coatings in excess of 0.001 inch thickness, the significance of this above mentioned fact is largely limited to electroforming operations where generally very heavy deposits are necessary.

II. Effect of increasing the acidity of the copper sulfate solution. Runs were made at four different sulfuric acid concentrations: 3.12, 5.98, 8.97, and 11.93 oz./gallon; and at many different urea concentrations ranging from 0.01 to 30 grams/liter of urea in solution. Increasing the acidity from 3.12 to 8.97 oz/gallon did not produce any significant changes of the physical properties of the cathode deposits regardless of the concentration of urea present in the bath. A further addition, resulting in a total of 11.93 oz./gallon of sulfuric acid in the plating solution, increased the roughness of the deposits somewhat. A more reddish color of the electrodeposited copper was also noted. As evidenced by some gassing and a decrease of cathode current efficiency, polarization was increased. This was noticed most when the amount of urea present in the plating solution was fairly high. Increased agitation of the bath decreased this effect, as did an increase in temperature. Prolonging the plating period at high acidites accentuated the changes discussed above.

III. Increasing the current density. Greater cathode current densities proved helpful in obtaining better colored, smoother, more uniform, and finer grained deposits provided sufficient agitation was used. An increase in current density to over 65-70 amp./sq. ft. using vigorous agitation produced rougher, less uniform, and often streaky plates. Without agitation in this current density range, "burnt" deposits were obtain-

NEW AUTO BUMPER OUTPUT *Speeded* BY SPECIAL JENSEN Infra-Red OVEN



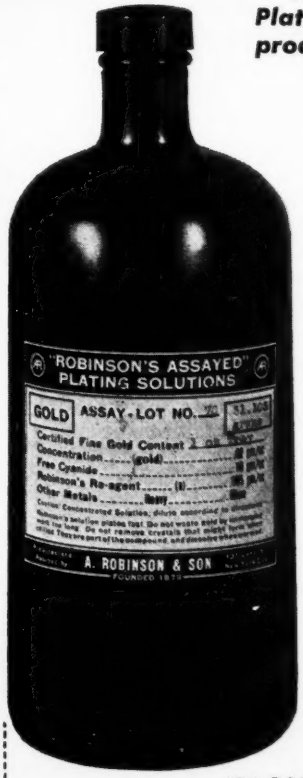
Chrysler and Dodge bumper frames are being finished with black baked out paint at remarkable rate of 300 per hour in Columbus, Ohio plant of Clark Grave Vault Company . . . in Jensen Infra-Red Oven only 21 feet long, using 864 lamps. *The secret:* Jensen "Dual-Heat"—a unique combination of *both* radiant energy heat and convection heat—*plus* Jensen "Nesting of Lamps"—a new method of *staggering* lamps to achieve far greater heat densities. **Write Jensen about *your* problem *today!***

Installation by Electric Power Equipment Co., distributors, Columbus, Ohio.

JENSEN SPECIALTIES, Inc. JENSEN 9331 FREELAND DETROIT 27, MICH.

DESIGNERS and BUILDERS of "DUAL HEAT" INFRA-RED OVENS • STANDARD and SPECIAL CONVEYORS

OLD IN YEARS — MODERN IN INDUSTRY



Platers and Manufacturers! Investigate our products—take advantage of "Robinson's 66 years in Precious Metals"

ROBINSON'S ASSAYED (100%) GOLD PLATING SOLUTION

FIRST IN THE FIELD

Robinson's Assayed Gold Plating Solutions were the FIRST Standardized Liquid Gold Concentrates. They succeeded because critical technical buyers, in and out of the plating room, adopted them and endorsed them.

They feature

Gold by weight, not by the quart
Continuous use of bath, through replenishment
Economy — Uniform Results

In calculating comparative costs, remember that

A Troy ounce contains 31.103 grams
An avoirdupois ounce contains 28.350 grams

And note that

Robinson's label says TROY and Robinson's Gold weights are 100%

ROBINSON'S ASSAYED POTASSIUM GOLD CYANIDE

IN SALT FORM

ROBINSON PRODUCED THE FIRST STANDARDIZED LIQUID GOLD PLATING CONCENTRATE
We now give you a Standardized

Potassium Gold Cyanide in Salt form

Successful in War, it has already been adopted by, and taken a place in, civilian trades.
Our label will give you the guaranteed Gold weight in TROY—100%

PROVEN PRODUCTS

Prepared and Guaranteed by

A. ROBINSON & SON

Founded 1879

131 CANAL STREET **NEW YORK CITY**

CAnal 6-0310 — 0464

ed, as was to be expected.

IV. Agitation. Vigorous agitation was found to greatly increase the smoothness and uniformity of the deposits obtained. A considerable decrease in grain size could also be noted. The color of the cathode plates was found to have improved also. Agitation permitted the use of higher current densities than otherwise possible without the danger of increased roughness and/or "burnt" plates up to 60 amp./sq. ft. Under these conditions, polarization was considerably decreased. The values of cathode current efficiencies were higher than those obtained without the benefit of agitation. It also served to decrease the effects obtained by the use of high acid concentrations (11.93 oz./gallon) in the plating bath, as has been mentioned previously.

V. Temperature. An increase in temperature up to 130 deg. F. did not greatly affect the physical properties of the cathode deposits. Polarization was found to have been decreased somewhat at higher temperatures. As the temperature was further increased, the effects obtained by the addition of urea were gradually lost. This is probably due to the hydrolysis of urea (see Reaction 2) which like all amides is hydrolyzed by both acids and bases to give the acid (carbonic acid) and ammonia.

Reaction 2

$$NH_2CONH_2 + 2H_2O \xrightarrow{H^+ \text{ or } OH^-} H_2CO_3 + 2NH_3$$

$$H_2CO_3 \xrightarrow{\text{heat}} H_2O + CO_2 \uparrow$$

Temperature probably increases the speed of this reaction, resulting in the gradual loss of those properties of the cathode deposit which were obtained by the addition of urea to the copper sulfate electrolyte. As may be expected, this effect is less marked if greater amounts of urea are present in the plating bath.

VI. Wetting Agent. A plating bath was prepared having the following composition:

$CuSO_4.5H_2O$ .....30.9 oz./gallon
H_2SO_4 (sp. gr. 1.84). 3.32 oz./gallon
NH_2CONH_2 (urea).. 0.08 gram/liter
Duponol (sulphonated lauryl alcohol) ... 0.1 gram/liter

The cathode deposits obtained from this plating bath were slightly smoother and finer grained than those obtained from an identical bath without the addition of the wetting agent. The slight improvement obtained was further lessened as the plating bath was put into extended use. At higher urea concentrations in the bath, similar results were obtained. Increasing the amount of Duponol present in the bath (1 gram/liter) produced a rather nicely salmon colored plate which was ductile, adherent, and fairly smooth. However, the brightness of the cathode deposits was not increased by using a wetting agent (Duponol).

VII. Carbon disulfide. As has been stated above, the substitution of a C =O for the C = S group in the thiourea molecule was accompanied by a rather complete loss of the brightening power of the bath. It was considered interesting to speculate upon the effect, if any, which would be obtained on the cathode deposits by the introduction of a C = S group in the bath with a view toward improving the brightness of the resulting plates.

"Custom-Tailored" Protection...

UNICHROME PROTECTIVE LACQUERS
fit products for their jobs

THE COMBINATION OF PROPERTIES you get in Unichrome Lacquers results in protection *tailored to the job* . . . gives your product a definite competitive "edge."

Maybe your problem is *one* of those listed at the right—or any combination of them. Turn to Unichrome organic coatings for the formulation that achieves the desired protection . . . and is easy and economical to use.

There's a Unichrome Lacquer to fit your product not only for service conditions, but for your production set up too. No cost-boosting operations need be introduced . . . whether you're protecting small, consumer goods . . . or adding corrosion resistance to large, industrial equipment.

Unichrome lacquers and synthetics are supplied clear or pigmented; for air-drying, or baking. We'll be glad to make recommendations for your special applications.

THERE'S A UNICHROME ANSWER TO PROBLEMS LIKE THESE . . .

Abrasion	Humidity
Outdoor Exposure	Sulfides
Perspiration	Heat
Light	Chemicals such as alcohols, alkalies, oil, grease, food stains, etc.
Marring	
Salt Spray	
Chrome-tanned Leathers	

Unichrome Lacquers

PRODUCTS OF **UNITED CHROMIUM** INCORPORATED

51 East 42nd Street, New York 17, N. Y. • Waterbury 90, Conn. • Detroit 7, Mich. • Chicago 4, Ill. • Dayton 2, Ohio

OTHER U. C. PRODUCTS AND PROCESSES: Chromium Plating • Porous Chromium • *Unichrome Strip *Unichrome Alkaline Copper • *Anozinc Compounds • *Unichrome Rack Coatings • *Unichrome Dips *Unichrome Stop-Off Lacquers and Compounds • *Ucilon Protective Coatings *Trade Mark Reg. U. S. Pat. Off.

A solution was prepared which consisted of the following:

$CuSO_4.5H_2O$ .....30.8 oz./gallon

H_2SO_4 (sp. gr. 1.84) 3.41 oz./gallon

An aqueous solution of urea was next prepared and carbon disulfide added to it to the extent of 0.20 gram per 100 ml. of water (which represents almost the complete limit of carbon disulfide's solubility in water at room temperature). The resulting product was added to the acid copper sulfate bath. The final plating solution was homogeneous and contained 1 gram/liter of urea and approximately 0.026 gram/liter of carbon disulfide. The cathode deposits obtained were salmon colored, less uniform, less smooth, and coarser grained than those obtained from a conventional acid copper plating bath. Streaks could be noticed in the deposit, while the cathode current efficiency was found to have been decreased considerably. Next, an attempt was made to introduce larger quantities of carbon disulfide in the bath by dissolving the material first in ethyl alcohol (infinite solubility) and then in water, etc. However, the resulting cathode plates were equally unsatisfactory. As the concentration of urea present in the bath was increased, the deposits obtained showed even less uniformity and still greater roughness, and no improvement in brightness was noted. Cathode current efficiencies were found to have decreased also, probably due to increased polarization, etc. Increasing the acidity had identical results.

VIII. Thiourea. The introduction of thiourea into the conventional acid copper plating bath containing urea as an addition agent produced all the characteristics associated with thiourea, such as brightness and brittleness, which have been discussed in a previous paper in detail[1]. The presence of urea even in larger quantities in the bath did not modify the results obtained by the action of thiourea, regardless of the amount of the latter present in the bath.

IX. Anodes. The anodes became covered with fine powdered copper and/or copper oxide during the series of experiments. This was especially noticeable with those solutions containing Duponol or carbon disulfide, but did not appear to interfere greatly with the smoothness of the deposits obtained. However, in practice, this would lead to trouble sooner or later and, for that reason, the anodes, more than likely, would have to be bagged.

X. Conclusions. The addition of urea to the conventional acid copper plating solution is beneficial in producing better colored, smoother, and finer grained deposits than those obtained without its use. Concentrations varying from 0.05 to 1.2 grams/liter are recommended for best results.

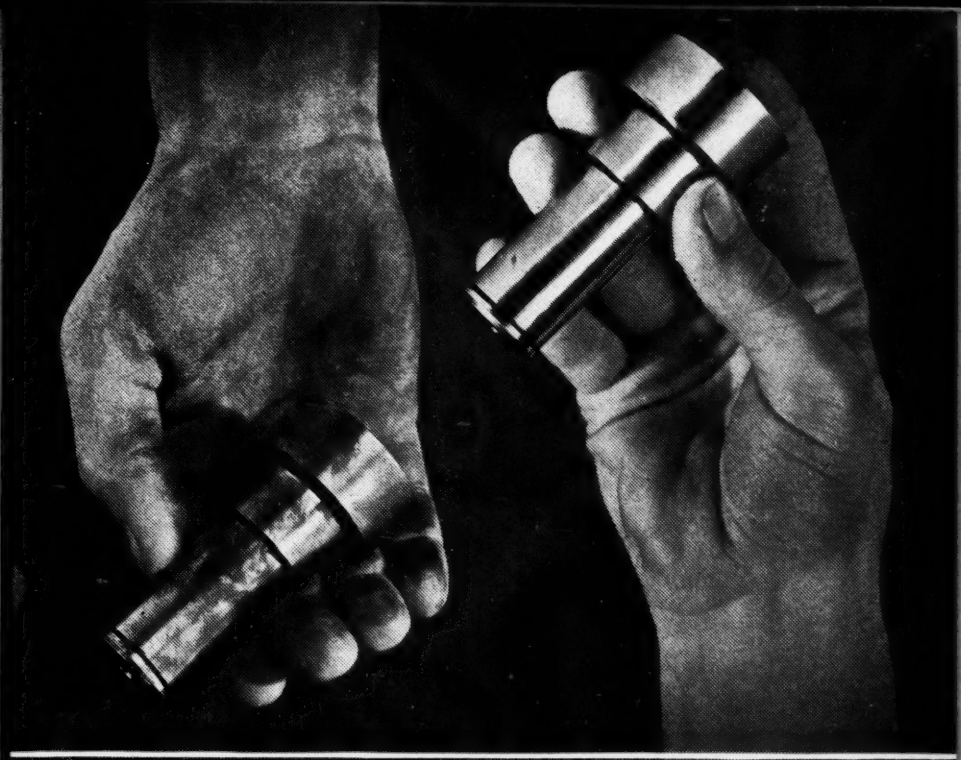
Ductility is maintained even if the amount of urea present in the bath reaches 30 grams/liter. The substitution of a C = O for the C = S linkage of the thiourea molecule is accompanied by an almost complete loss of the brightening power so characteristic of thiourea's behavior in the acid copper sulfate electrolyte. Agitation and increased current densities are helpful in producing somewhat better colored, smoother, and finer grained cathode deposits. The bath is not sensitive to temperature variations in the usual range used for the acid copper sulfate bath.

Neither the introduction of a wetting agent (Duponol) nor that of a C = S group in the bath helped to improve the brightening power of the plating solution.

REFERENCES:

[1] "Thiourea in Acid Copper Plating Solutions," Walter Brenner and Dr. C. B. F. Young, PRODUCTS FINISHING, Oct. 1945, pp. 76-90.

[2] Werner monograph, "The Chemistry of Urea," 1912.



KNOCKING THE *Spots* CLEAN OFF!

SUN SPIRITS . . . Eliminates Stains on High-Finish Metal

A manufacturer who required a high finish on machined-parts was using an ordinary petroleum solvent for cleaning.

Stains appeared on the metal wherever drops of the slow-drying solvent had hung on without evaporating. As a result, an excessive number of parts was being rejected.

Rejections were completely eliminated after Sun Spirits was introduced for metal-cleaning. The new cleaning-process with Sun Spirits has really knocked the spots off the old-time record.

Sun Spirits is a highly refined solvent. Volatility is carefully controlled to insure prompt, even evaporation. Chemical analysis is held to exacting limits to produce spotless work.

Hundreds of plants use Sun Spirits for metal-cleaning, because of its quality, and because it also provides an easy, one-step cleaning-process, which is both reliable and economical. Call the Sun man near you for further information. Or write . . .

SUN OIL COMPANY • *Philadelphia 3, Pa.*

Sponsors of the Sunoco News-Voice of the Air — Lowell Thomas

SUN

SUNOCO

INDUSTRIAL PRODUCTS

Custom Finishing on a Mass-Production Basis

By E. W. SINCLAIRE*
as told to Burr Price

PRIME among war-learned lessons is that of custom finishing on a mass-production basis for the individual end use of each product. Therefore, as reconversion poses new problems for all manufacturers in the products finishing field, the paint manufacturing industry is striving to meet the challenge with the same ingenuity and resourcefulness which made its contribution to the war effort so effective.

* Manager, Industrial Finishes Dept., Breinig Brothers, Hoboken, N. J.

A Problem in Service Engineering

Illustrative of this is a recent case

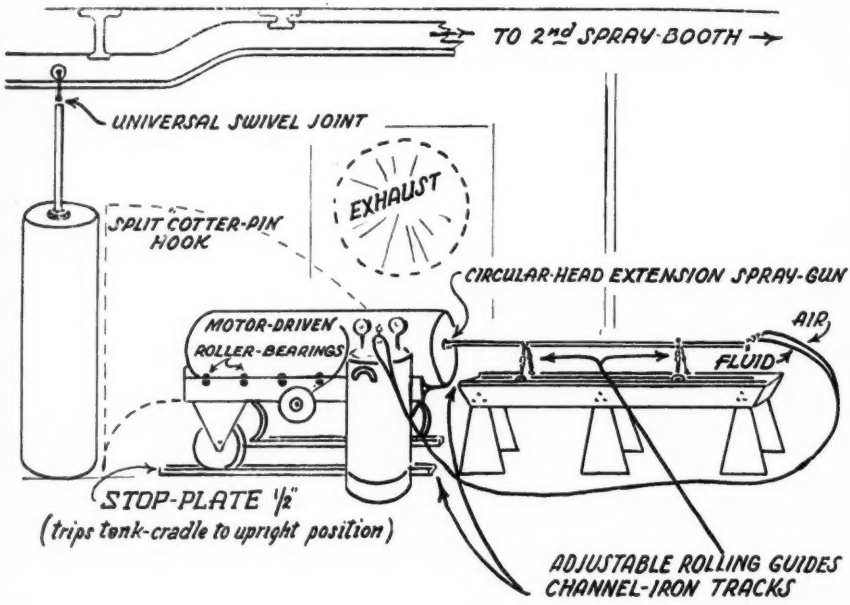


Fig. 1—Drawing showing equipment required for coating the insides of water-filter tanks with an acid and alkali-resistant lining and the application of a decorative and protective baked finish on the outsides

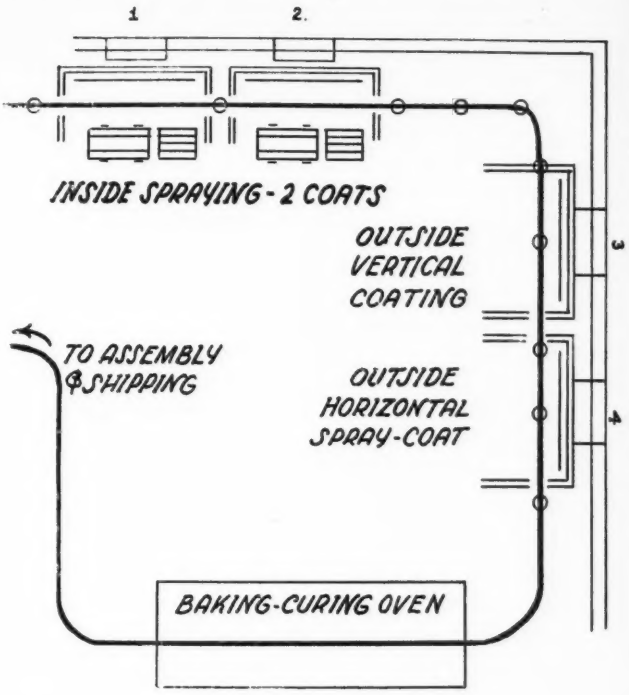


Fig. 2 — Floor plan showing the location of the four spray booths and the baking-curing oven used in finishing the water-filter tanks

of service engineering which dealt with a problem of coating the insides of 20 x 62-inch water filter tanks with an acid and alkali-resistant lining and the application of a decorative and protective baked finish on the outsides. The manufacturer desired a production of about 100 tanks daily. The specifications called for a two-coat job on the insides of the tanks to ensure against pinholeing defects. The outsides were to have two coats of baked enamel of selected color and marproof hardness.

Equipment required for the operation was as follows: Serpentine 125-foot monorail; four 4 x 7 x 7-foot spray booths with exhausts; two horizontal "cradles" (as per illustration) with channel tracks; two horizontal supporting jigs for two 4-foot 6-inch extension spray guns; two production spray guns; four 10-gallon pressure tanks; one 30-foot paint-baking kiln; two 10 h.p. compressors (for alternate individual operation); and 100 "cotter-pin" hooks of length needed. Personnel required included four sprayers and two helpers (or one helper and the foreman).

Technique of Application

The horizontal "cradle" is placed in an upright (vertical) position, and a flat flange is slid under the upright tank, after which both are tripped into a horizontal position on the "stop-plate" and along the channel-iron tracks as shown in Fig. 1. A circular-head extension spray gun is inserted into the tank to its full length, the trigger is engaged, and the lining material is applied as the gun is withdrawn, a tank-revolving motor turning the tank. The "cradle" is now tripped back to a vertical position again, a "cotter-pin" hook is inserted in the top opening, suspending the tank from the monorail, and the tank is pushed onto the straight-of-way monorail to clear it off the floor.

Next, the tank is put through the

same operation in the second booth for a second interior coating, and is then moved onto the third booth where it is sprayed with vertical strokes with an outside baking enamel. A second outside coat is applied to the tank in the fourth booth where horizontal-stroke application is employed. After this, the tank is passed through the drying oven where both coats are baked and cured in one operation. (Fig. 2 is a floor plan showing the location of the four spray booths and the baking-curing oven.) The tank is now passed on for gaging, assembling, and shipping.

Surface Preparation

If tanks are of black metal, they are degreased and surface converted with a phosphatizing treatment. If they are galvanized, they are prepared by a coating of "Lithoform" (American Chemical Paint Company) or a product of equivalent properties. In either case, the tanks are dried and preheated by passage through a kiln and air cooled for 5 to 10 minutes.

Fire Protection for Electrical Apparatus

ELECTRICITY, when properly used, is not a fire hazard; but, as mishandling and accidents are not always avoidable, electrical apparatus should be protected by suitable fire-extinguishing equipment.

For protecting small open and semi-enclosed rotating units, switches, appliances, and other commonly-used electrical devices, portable vaporizing liquid or carbon dioxide fire extinguishers may be employed. These extinguishers discharge non-conducting extinguishing agents that may be used on live equipment without danger of subjecting the operator to shock, causing short circuits, or damaging the equipment. In addition, they are effective on fires in the oil often used in transformers, circuit breakers, and so on.

In installing these extinguishers, at least one large or two small units, bearing the approval of the Underwriters' or Factory Mutual Laboratories, should be placed near each piece of apparatus to be protected. More may be needed for such equipment as large motors, generators, and switchboards. They should be mounted where they are readily accessible, but not on the protected apparatus nor where they are likely to be cut off by fire.

Most small electrical fires may be quickly extinguished by applying vaporizing liquid or carbon dioxide and cutting off the apparatus involved. If deep-seated fires resist these extinguishants, water may be used, but not on live apparatus.

As the gases given off by burning insulation are poisonous, vaults and other enclosures containing electrical equipment on fire should not be entered without suitable gas masks. When such protection is lacking, it is desirable to stay outside the enclosure in the open air while fighting the fire. If this is not possible, leave as soon as the fire is out and do not return until all smoke and odors are gone.

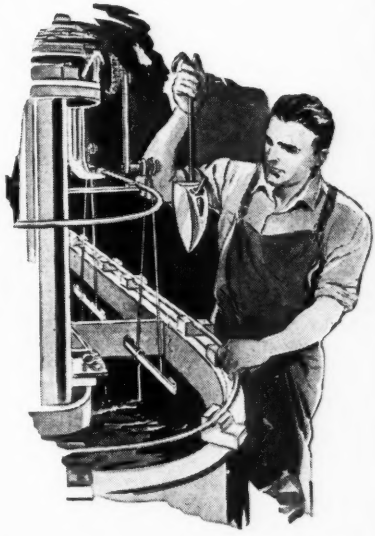
All workers who may have occasion to control electrical fires should be taught how to use the extinguishers and what to do when the emergency arises. Prompt and effective action, ensured only by training, minimizes fire losses.

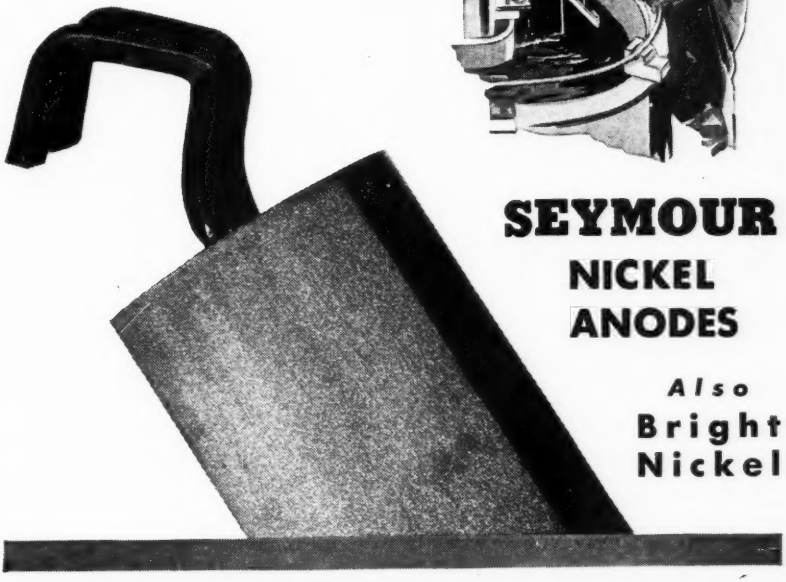
(Courtesy Safety Research Institute, Inc., New York, N. Y.)

WHAT IS YOUR PREFERENCE IN ANODES?

Do you prefer your nickel anodes rolled—like them with lots of carbon — want the grain fine or coarse, the shapes straight, flat, curved or tricky?

Whatever your pet requirement is, a "Seymour" can be had to meet it. Seymour Nickel Anodes are made of virgin nickel cast in the electric furnace under accurate pyrometric control and laboratory check. Seymour Anodes are also made of copper, brass, bronze and zinc. No priorities.





SEYMOUR
NICKEL ANODES

Also
Bright Nickel

THE SEYMOUR MANUFACTURING CO., SEYMOUR, CONN.
NONFERROUS ALLOYS SINCE 1878

Are Porcelain Enamels Threatened by New Plastics?

By DR. G. H. McINTYRE
Director of Research, Ferro Enamel Corporation
Cleveland, Ohio

SILICONE is the intriguing name given a unique type of plastic announced in trade publications, scientific journals[1] and in such popular magazines as "Reader's Digest."[2] The substances given this name are products of synthetic chemistry wherein for the first time, inorganic silicon (one of the most abundant elements on this earth) is joined with organic radicals of carbon, oxygen, and hydrogen to form large polymerized molecules yielding substances commonly known as resins. These resins differ from those heretofore produced, particularly in one important property—their resistance to heat. This heat stability is due in large part to the presence of the inorganic part of the molecule. Other distinctive properties are also present, but to the manufacturer of finishes and to the man concerned with choosing the best finish for his product, the durability of these new resins and their great resistance to heat are most important.

Popular writers have predicted that these new resins will replace porcelain enamel because they can form the basis of a synthetic or resinous paint that can be applied in a manner similar to that of the present resinous base, thermo-setting paints and retain the advanages of porcelain enamel as to hardness of surface and heat resistance. Actually, this is not the case, nor is it ever likely to be so. Not even those scientists engaged in the development and production of these resins make any claims regarding their equality to porcelain enamel in these properties.

The very fact that the largest part of the structure of the molecule is still organic makes these resins nonresistant to temperatures easily withstood by porcelain enamels. Actually, silicones will withstand temperatures only 100 to 200 deg. F. higher than other resins used in organic finishes. Experiments are being conducted by several manufacturers of organic finishes to produce coatings with silicones as basic ingredients. Tests have shown that coatings of higher heat resistance and longer life than now available with conventional resins can be made and are or soon will be available. These finish materials must be considered as intermediate between presently known organic coatings and porcelain enamels, but much nearer to the organic coatings in all properties.

As is now being demonstrated, each product has its place in the present fields of surface coatings, and the applications for porcelain enamel are becoming greater than ever before. Por-

[1] Chemical Industries, Vol. 55, No. 2, Pg. 222, Aug. 1944, "Organo-Silicon Compounds Emerge from the Laboratory."

[2] Reader's Digest, Vol. 46, Pg. 37-39, March 1945, "Here's Something Really New — and Strange—in Plastics."

Good Equipment Pays Its Way!

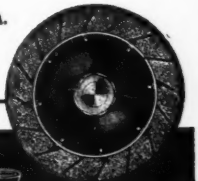
In 1946 come out fighting! Back up your polishers with the best machinery modern genius can produce. The better the equipment, the faster and better the output. This Overhung Buffing Lathe, No. 342 in the new "Bridgeport" line, is definitely such equipment. Note these outstanding refinements:

Overhung Spindles, for extra foot and bench room,
Hand Brake in front, in easy reach of operator, shuts off motor and locks spindle,
Motor located in base,
Ball Bearing Quills,
Labyrinth Dust Seals,
Streamlined, easy to keep clean.

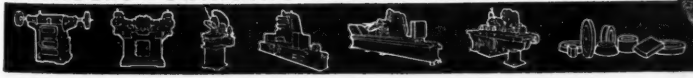
Lack of space prevents going into detail here, but complete technical information is available on request.

THE BRIDGEPORT SAFETY EMERY WHEEL CO., INC., BRIDGEPORT, CONN., U. S. A.

Bridgeport



GRINDERS • GRINDING WHEELS • BUFFING LATHES



celain enamel has the advantage of long life, great resistance to heat and corrosion, beauty, and low cost. Its corrosion resistant properties have only begun to be appreciated. Many new uses were found for porcelain enamel in the production of war items and in replacing scarce alloys. These applications, in addition to the long recognized uses which will be continued because of the thinner and more durable coatings now available in porcelain enamel, ensures a great future for this highly useful finish.

Special Hose Used to Spray Hulls with Hot Plastic Paint

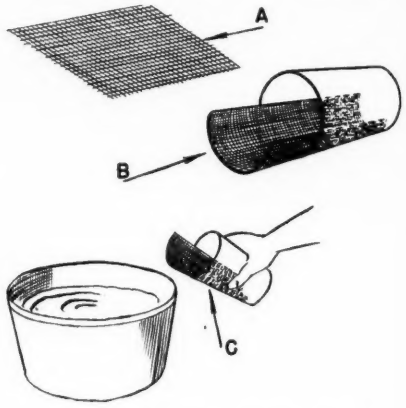
A SYNTHETIC rubber hose reinforced with Fiberglas inner braid through which hot plastic paint can be passed at a temperature of 300 deg. F. has been developed by DeVilbiss Company engineers. The hose is used by the Navy to deliver the hot paint in a spraying operation on ships' hulls, the paint forming a "skin" to minimize barnacle growth. The application of hot plastic paint to ships' hulls is said to double the time that a ship can stay out of dry dock before barnacle removal and still operate efficiently.

Standard Navy practice is to spray the hulls of vessels before they leave for missions in warm water areas. With spray painting equipment involving the use of this new hose, a crew of 140 men can apply the hot paint to an entire battleship hull in 16 hours, it is claimed.

According to the manufacturer, the new paint spraying hose, reinforced with two inner braids of Neoprene-coated Fiberglas yarn, has a minimum bursting pressure of 2,000 lb. per square inch. Since the hot plastic paint is forced by compressed air through the hose at a pressure of 100 lb., an adequate margin of safety to the operator is allowed and deterioration of the rubber is minimized. The hose, which has an inside diameter of ½ inch, is said to withstand maximum temperatures up to 400 deg. F.

Improvised Solution Skimmer

QUITE often it is necessary to skim off the foam and other risings from either hot or cold solutions when preparing mixtures and, as is usually the case, there is no means readily at hand to do the job. The drawing herewith shows a combination skimmer and dipper that can be readily devised and which should serve very well in skimming off solutions.



Drawing of improvised solution skimmer

The device consists of a piece of window screen wire, **A**, which is approximately 2 inches longer than the conventional tin can and which is slipped into the can in the manner shown at **B**. The device is then used in a manner similar to that shown at **C**, with the screen portion extending from the can being used in skimming the scum off of the mixture and the tin can itself serving as a receptacle for the scum as the device is tipped down at the back.

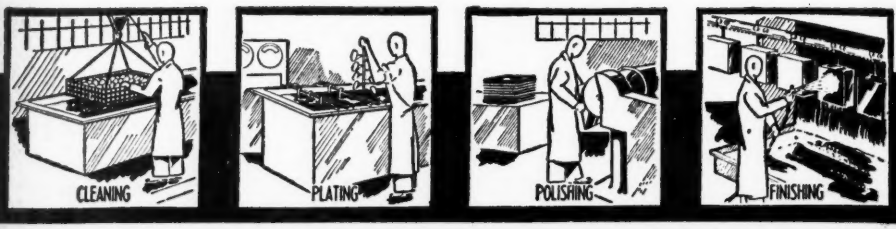
ILLBRONZE
BRAND

BRONZE POWDERS, PASTE
and CHROME PAINTS

"Dress-Up" SALES APPEAL
for Products in Metal,
Wood, Plastic, Paper...

Used by craftsmen all over the world! Metallic finishes in many special shades and various textures! The kind of quality that means you can look to Illbronze with complete confidence for your needs at low costs! Fine Pale, Rich and Deep Gold Lining Powder, Silver Fixture and Butler Silver, Copper and Aluminum Powders and Paste, Special "quick-drying" Chrome Finish paint, R. M. Aluminum Lacquer and Lacquer Thinner. Inquire for lowest prices, and samples if desired.

ILLINOIS BRONZE
POWDER CO., INC.
Dept. PF, 2023 S. Clark St.,
Chicago, 16



News of the Industry

Appointed Sales Engineer

According to an announcement received, Capt. Samuel Alsop, Jr., has been released from the U. S. Army after 34 months overseas where he was the commanding officer of the 920th Air Engineering Squadron and earned the Meritorious Service Plaque for distinguished

Capt. Samuel Alsop, Jr.

service in action in France, The Rhineland, and Central Germany campaigns.

Capt. Alsop attended New York Electrical School and previous to entering the service was employed by Stearns & Beale, a photo offset firm in New York. His present duties are that of sales engineer for the Alsop Engineering Corp., Milldale, Connecticut.

Dampney Acquires Thurmalox

The Dampney Company of America, Boston, Mass., announces the acquisition of the Thurmalox Co., Doylestown, Pa., manufacturer of Thur-Ma-Lox No. 7 Black and No. 10 Aluminum for coating hot dry surfaces up to 1,600 and 1,200 deg. F. respectively. The company also manufactures a Thurco line of eight coatings for temperatures up to 800 deg. Fahrenheit.

These new products will round out the Dampney line of specialized protective coatings for industrial application which have heretofore featured D a m p n e y "Apexior" No. 1 and "Apexior" No. 3 for hot-wet and cold-wet applications respectively.

Norton Names New District Manager

Clarence L. Smith has been appointed Detroit district manager for the Grinding Machine Division by the Norton Co., Worcester, Mass. He succeeds Oscar A. Knight who retires after over 40 years of service with the company, the major part as Detroit district manager for the sale of Norton grinding and lapping machines.

Mr. Smith has been with the Norton Company since July, 1923 and for the past seven years has been sales engineer of the Grinding Machine Division with headquarters at Worcester. Just before the outbreak of the war, he spent over a year in Europe on special grinding machine sales engineering work.

H-VW-M Adds to Staff

A number of changes in the staff and field forces of the Hanson-Van Winkle-Munning Co., Matawan, N. J., have been announced. These changes include the

John A. Bauer

return of several of its staff from the armed forces and also the addition of new men.

John A. Bauer has been appointed sales manager of the company. Mr. Bauer has been with the company almost 20 years,

Ralph R. Granquist

coming from A. P. Munning and Company, which he had joined in 1926 as advertising manager. He took the same post with H-VW-M in 1927 after the merger of A. P. Munning and Company and the Hanson and Van Winkle Company. In 1933, Mr. Bauer took charge of the Pittsburgh office; from 1934 to 1936, he managed the Philadelphia office, and, from 1936 to 1939, he was in charge of the New York office. In 1939, he was appointed assistant sales manager with headquarters in Matawan. His responsibilities as sales manager will be the handling of general administrative problems.

Ralph R. Granquist has been appointed manager of the Chicago office of the company. Following his graduation from college, Mr. Granquist engaged in other fields for a time and entered the employ of the Hanson and Van Winkle Company in 1923. He has been a field representative, located in the Chicago office, since that time and is widely known in this territory. Harold R. Smallman, who also maintains his head-

Edward M. Close

quarters in the Chicago office, remains as western manager.

William J. Wise, formerly a field representative of the company and more recently a lieutenant in the U. S. Navy, has rejoined the company. Mr. Wise is a graduate of the University of Dayton in chemical engineering. He spent nine years with the National Cash Register Company and joined H-VW-M in 1940. In 1942, he entered the Navy. Mr. Wise will make his headquarters in Dayton, Ohio.

Edward M. Close has been appointed assistant purchasing agent, working with Robert A. Malkmus, head of that department. Mr. Close was graduated from Lehigh University in 1937 with a degree of Bachelor of Science in business admin-

istration. He was engaged in the hardware industry until 1941, following which he served in the Sales Department of the Hanson-Van Winkle-Munning Company, Matawan, until November 1942. From that date until October 1945, he served as supervisor of priorities.

Walter J. Jurman, who was with the company for a number of years before the war and who left to join the Navy, has recently been discharged and has rejoined the company. Mr. Jurman attended Rutgers University where he specialized in business administration.

Walter J. Jurman

From 1935 until 1942, he was employed in the Sales and Advertising Departments in Matawan. In February 1942, he enlisted in the U. S. Navy. Mr. Jurman has been assigned to the Chicago office where he will be in charge of the Order Department.

Hugh Vincent McQuire was in the employ of the company in 1940, engaged in cost work in connection with the electrical manufacturing department. In the fall of 1941, he enlisted in the U. S. Navy. He is currently assigned to the Sales Engineering Department at Matawan.

Robert A. Noland has joined the company as a field representative. Mr. Nolan attended the Lewis Institute of Technology where he received the degree of Bachelor of Science in mechanical engineering and also received specialized training in metallurgy and chemistry. Prior to becoming associated with H-VW-M, he was engaged as assistant metallurgist at the Buick Motor Division, G. M. C., Melrose Park, Ill. He has been assigned as field engineer located at the Chicago office.

Myron B. Diggin, chief chemist of H-VW-M, has been appointed director of Project No. 4 of the A. E. S. Research Committee. This project will consist of an investigation into the effect of polishing non-ferrous metals on the protective value of electroplated coatings on them.

Sun Chemical Appointments

The board of directors of the Sun Chemical Corporation announces the appointment of John F. Devine as divisional president and Frederick H. Farnsworth and Harold A. Kernell as divisional vice presidents of the General Printing Ink Company Division.

Pennsalt Plant Superintendent Retires

Charles G. Boone, superintendent of the Pennsylvania Salt Manufacturing Company plant at Natrona, Pa., has announced his retirement after 21 years as head of Pennsalt's Natrona operations. Mr. Boone, now 67, became superintendent of the Natrona plant on January 15, 1925, three months after he joined Pennsalt in the Philadelphia headquarters.

LaLande to Head Whitemarsh Research Laboratories

Dr. W. A. LaLande, Jr. has been appointed director of Whitemarsh Research Laboratories of the Pennsylvania Salt Manufacturing Company. Dr. LaLande, formerly director of research of the Attapulgus Clay Company and previously a member of the chemistry faculty of the University of Pennsylvania, came to Pennsalt in August, 1944 as director of the Research Division. In his new position, he will have charge of all activities at the new Whitemarsh Research Laboratories except those of the Patent Division. These activities include laboratory research, pilot plant operations, product evaluation studies, and technical sales service work.

Dr LaLande, a native Philadelphian, received his undergraduate and graduate training at the University of Pennsylvania prior to spending a year at the Swiss Federal Polytechnic Institute at Zurich.

Mirror-Finish—Water White

MICCROLAC

A NEW HIGH-LUSTER COATING WITHOUT EQUAL

MICCROLAC Has These Outstanding Characteristics

- Dries to a very high lustre.
- Provides adhesion which cannot be matched by any similar material.
- Extremely flexible—resists bending and vibration.
- Has unequaled abrasion resistance, does not chip or crack.
- Very fast drying. Dries to handle in few minutes.
- Offers excellent resistance to sulphur dioxide, sunlight, moisture (preventing rust), oil, grease, gasoline, and all commonly known chemical fumes. Also salt spray, acids and alkalies.
- Is water-white—eliminates color tinge.
- Does not blush even in humid weather.
- Can be sprayed or dipped, on small parts can be applied by brush.

Protects and Beautifies All Metal Finishes

Mirror-Finish MICCROLAC is a totally new product—a high-luster protective finish that will meet your specific needs more successfully than any similar product you have ever used.

MICCROLAC has no equal as a protective coating for silver plated ornaments, trophies, lighting fixtures, and all decorative metal finishes — also polished brass or brass plated products, interior and exterior hardware, metal mouldings, automobile hardware and exposed metal surfaces of scientific instruments.

Try MICCROLAC without cost. Upon request a trial quantity will be sent free—without obligation.

COMING!

Another MICCRO first! A rack coating that will definitely meet the requirements of every plating cycle. Look for it!

Write for Bulletin

MICCRO Products

Manufactured and Developed by Experienced Platers

MICHIGAN CHROME and CHEMICAL COMPANY

6340 East Jefferson Avenue · Detroit 7, Michigan

E. L. McIlhenny Joins Ferro Enamel

E. L. McIlhenny, for the past eight years with the Detrex Corporation of

E. L. McIlhenny

Detroit, has left that organization to join the research and field service staff of the Ferro Enamel Corporation of Cleveland. He will make his headquarters in that city.

Widely known in the detergents and metal-cleaning field, Mr. McIlhenny brings 18 years of experience to the solving of such problems for Ferro's customers. A graduate of Washburn College, Mr. McIlhenny took a two-year post graduate course in chemistry at the University of Minnesota before entering business. He is a member of the American Ceramic Society and the American Electroplaters' Society.

Robert J. Landon Joins Alsop

Recently released from the U. S. Maritime Service after 34 months service, Robert J. Landon has joined the Alsop Engineering Corp., Milldale, Conn. Previous to entering the service, Mr. Landon had 8 years of experience in advertising, being formerly associated with the Chase Brass & Copper Co., Waterbury, Conn. He is at present advertising manager of the Alsop Engineering Corporation.

American-Marietta Appointments

Grover M. Hermann, president, American-Marietta Company, paint manufacturer, announces the appointment of Weldon O. Yocum as director of advertising for the parent company and eight divisions in the United States and Canada. Mr. Yocum is advanced to his new responsibility from the advertising managership of the Sewall Paint and Varnish Company, a subsidiary, of Kansas City and Dallas.

Harry Ault has been appointed advertising manager of all American-Marietta operations. Robert Ornberg, recently released from the Army, has rejoined the company as assistant advertising manager.

Diversified Educational Program Arranged for Pittsburgh A. E. S. Convention

The tentative educational program for the 33rd A. E. S. National Convention to be held at the Hotel William Penn in Pittsburgh, June 17-20, 1946 is well underway toward completion. Presentation and discussion of the work of the A. E. S. Research Committee has been allotted one and one-half sessions; papers on organic coatings and finishes one session; strip plating one session; and miscellaneous plating and subjects one and one-half sessions. Plant inspection trips will be included in the program.

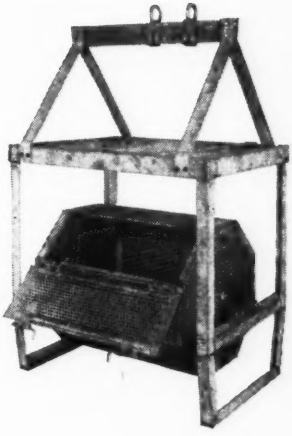
The sessions devoted to the activities of the Research Committee should prove of valuable interest and will also afford an opportunity for members to become acquainted with the personnel engaged on the various research projects. The session on organic coatings and finishes will be devoted to the advances in the development of tank linings, corrosion resistant equipment, rack coatings, and similar materials. It will also cover developments in protective and decorative organic finishes.

A large attendance is anticipated due to the inclusion of a session on strip plating. The session is planned to cover various technical aspects of this relatively new subject and to guide the interest in this electroplating development to within the scope of the American Electroplaters' Society.

ROLOCK

PROCESSING CARRIERS

Rolock engineers are specialists in designing all kinds of carriers to best handle metal parts through your processing. This rotating barrel for pickling cup-shaped parts is a good example of this kind of specialized service. Subsequently equipped with a motor drive, the frame rests on the tank bottom and has an adjustable two point lifting arrangement. Specially designed, highly corrosion-resistant plastic bearings do not require lubrication and are easily replaced.



Tell us your needs for custom-built baskets, trays, racks, crates and fixtures for handling and carrying loads from a few ounces to 8000 lbs. Rolock will make them to withstand the greatest resistance to all exposures and abrasion . . . giving them a longer service life at lower hourly cost.

ROLOCK, INC.

1400 Kings Highway East, Fairfield, Conn.

Miller to Machine Division Post

The appointment of George E. Miller as assistant sales manager of its Machine Division sales department is announced by The Osborn Manufacturing Co., Cleveland, Ohio, manufacturer of foundry molding machines and power brushes for industry. Mr. Miller, a graduate of Case

George E. Miller

School of Applied Science, was formerly vice president in charge of sales and engineering for the Smith Power Transmission Company.

Changes in Sales Staff

A number of important sales territorial changes have been announced by L. L. Andrus, vice president in charge of sales of the American Foundry Equipment Co., 555 S. Byrkit St., Mishawaka, Ind. A. H. Freeman has been appointed sales representative with headquarters in Milwaukee, Wisconsin. Mr. Freeman was recently sales engineer in the Detroit office and has been with the company continuously since 1918 in important manufacturing, service, and sales positions.

Vernon S. Spears, who served several years in the Northern Indiana sales territory, has been named sales representative, covering practically the entire state of Indiana. Prior to his appointment to the sales staff, Mr. Spears served in the sales department of the home office for many years.

Charles E. Ludwig has been named sales representative in a newly created territory, with headquarters in Buffalo, New York. He has been with the company for 11 years and, prior to this appointment, was sales representative in the St. Louis, Missiouri territory.

Donald E. Matthews has been appointed sales representative with headquarters in St. Louis, Missouri. Mr. Matthews was formerly connected with the Soreng-Mannegold Company, Chicago, as works manager and sales engineer.

Joseph F. Underway, formerly field engineer of the East Texas Electric Steel Co., Longview, Texas, has been appointed sales representative, with headquarters in Houston, Texas. He has been associated with the foundry business for approximately 20 years in various capacities.

Robert A. Campbell has been named Canadian sales engineer with headquarters in Toronto. For the past three years he has been associated with Salem Engineering, Ltd., Canada, as sales and design engineer. Prior to that he was superintendent of the Ammonium Nitrate Plant, Welland Chemical Works, Ltd., Niagara Falls, Canada.

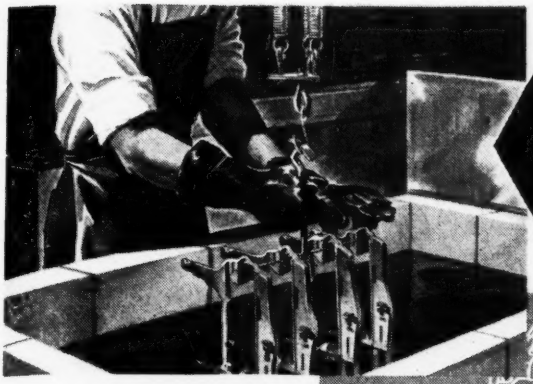
G. R. Bryant, formerly a sales engineer in the Buffalo and New York City sales offices of the General Electric Company, has become associated with Robert L. Orth as sales engineer in the Detroit office.

John N. Harper has been appointed sales representative, with headquarters in Pittsburgh, Pa. Mr. Harper has operated as a manufacturer's agent in Pittsburgh for many years and has had broad experience with steel products and finishing materials.

Named President and General Manager

Kennneth E. Clarke has been named president and general manager of the Ferbert-Schorndorfer Division of the American-Marietta Company, according to an announcement by Grover M. Hermann, president. Mr. Clarke fills the position formerly held by David Andrew whose death recently occurred.

Specializing in metal and automotive finishes, the Ferbert-Schorndorfer Company manufactures industrial finishes of all types. There will be no changes in sales and management policies, and a planned program of expansion will be furthered under the direction of Mr. Clarke.

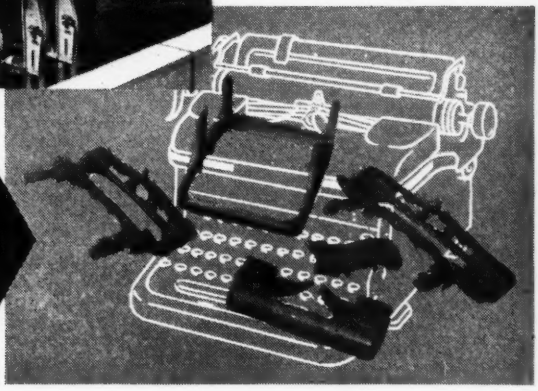


IRIDITE DIPPED!

Immerse parts manually or automatically—on racks or in bulk—for 15 to 60 seconds—quickly dried for immediate handling.

CORROSION WHIPPED!

Iridited parts in finished product will not corrode—are longer lasting—hold paint firmly—like these Woodstock Typewriter components.



Quick Dip Process Puts Finishing Touch on Zinc, Cadmium, Galvanized Products!

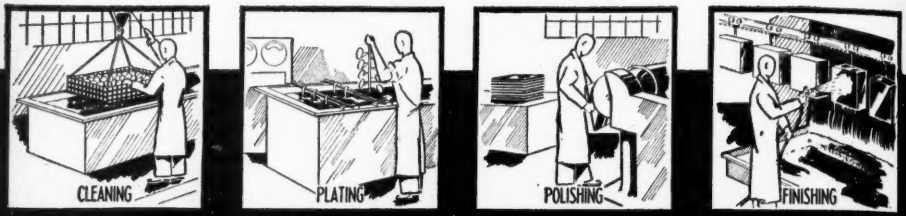
If you're manufacturing products of zinc or cadmium plated, galvanized steel or zinc die castings . . . Iridite offers a fast, sure way to beat corrosion . . . and boost sales appeal and profits! *As a final protective finish,* it balks corrosion while adding colorful eye-appeal. *As a paint base,* it holds paint permanently. And you can combine Iridite with zinc plating to replace more expensive materials and reduce costs.

Iridite *unites chemically* with zinc or cadmium, thus does not flake, chip or peel. It does not alter dimensions and can therefore be used on close tolerance parts. Currently available in olive drab, black and transparent Iridite-Bright. For indoor exposure in blue, green, red and bronze. Send for free panel . . . half coated with Iridite, half unprotected . . . to test in your own laboratory. You'll see the difference. Rheem Research Products, Inc., 1492 Standard Oil Bldg., St. Paul and Franklin Streets, Baltimore2, Maryland.

Branches — 570 Lexington Ave., New York 22; 20 E. Jackson Blvd., Chicago 4; 2411 Sichel St., Los Angeles 31; Distribution in: Waterbury; Detroit; Los Angeles.

Reg. U. S. Pat. Off.

RHEEM RESEARCH PRODUCTS, INC.
IRIDITE
Standard Oil Bldg. Baltimore 2, Md.



New Equipment and Materials

Kindt-Collins "Master" Disc Grinder

A versatile 24-inch disc grinder for grinding metals, plastics, and other materials, to be known as the "Master," has been brought out by The Kindt-Collins Co., 12651 Elmwood Ave., Cleveland 11, Ohio. The specific disc speeds required for grinding these materials are readily available.

Special features of the machine include a heavily-ribbed, normalized and machined table which can be tilted 45 degrees down and 25 degrees up by a worm and gear drive; double-face grinding disc; and circular and core print fixture of wedge-shape design with 10-degree angle and capacity for work up to 22 inches in diameter. The disc is constructed to accommodate both flexible back cloth and paper back abrasives.

Two models of the Kindt-Collins Master Disc Grinder are available. The Model A is furnished with its own dust collecting system, and the Model B is equipped with a 4-inch exhaust tube to be attached to the plant dust-collecting system.

Kindt-Collins "Master" Disc Grinder

"Amercoat" Nos. 59 and 60 Surface Preparations

The Amercoat Division of the American Pipe and Construction Co., P. O. Box 3428, Terminal Annex, Los Angeles 54, Calif., announces two new products supplementary to its line of "Amercoat" plastic coatings; namely, Amercoat No. 59, which is intended for the treatment of galvanized metal surfaces prior to the application of a protective coating, and Amercoat No. 60, which is designed for the surface preparation of copper and brass prior to the application of a protective coating.

According to the manufacturer, these surface treatment solutions are recommended for use where shot or sandblasting are impractical. The resulting adhesion of the protective coating is described as excellent where applied over a zinc, copper, or brass surface properly prepared by Amercoat Nos. 59 and 60.

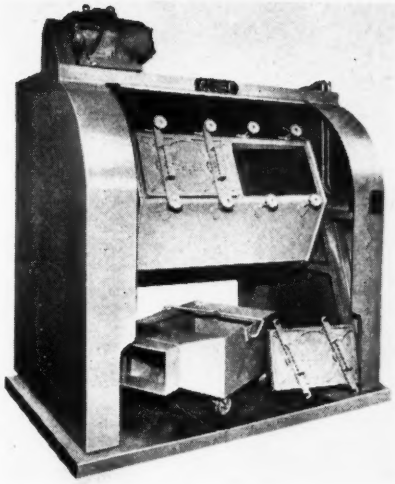
Enthone Enamel Stripper S-300

The development of a stripper for the removal of many types of organic coatings, to be known as Enthone Enamel Stripper S-300, is announced by The Enthone Co., Dept. PF, 442 Elm St., New Haven, Conn. Synthetic enamels, such as alkyds, melamine, and urea formaldehyde coatings, are said to be readily stripped with the product, which can be used full strength at room temperature or diluted with water and the mixture heated in the temperature range of 150 to 180 deg. Fahrenheit.

With Enthone Enamel Stripper S-300, enamels are stated to be removed thoroughly by a wrinkling action, leaving the work clean and bright. According to the manufacturer, the base metal is not attacked, and such active metals as aluminum, zinc, and tin are unharmed. Phosphate coatings and anodized coatings are also said to be unaffected by the stripper.

Globe "Burr-Rite" Senior Tumbling Barrel

Designated as the Globe "Burr-Rite" Senior, a tumbling barrel for mass production, precision deburring has been brought out by The Globe Stamping Division, Hupp Motor Car Corp., Cleveland 2, Ohio. Adaptable for finishing steel, aluminum, brass, and die castings, the unit features large door openings for easy loading and unloading of workpieces. In addition, a hoist pan is provided to simplify the handling of parts.



Globe "Burr-Rite" Senior Tumbling Barrell

The barrel is equipped with lightweight aluminum doors having quick-opening clamps, and is lined with durable hard maple to provide for long shell life. According to the manufacturer, an outstanding advantage of the unit is the fact that compartments can be relined without removing the shell.

The Globe Burr-Rite Senior Tumbling Barrel is available in three models; namely, a single, double, and triple compartment model. The single compartment model has a cubical content of 18.4 feet. In the double compartment model, each compartment has a capacity of 9 cubic feet, and, in the triple compartment model, each compartment has a 5.1-cubic foot capacity. The double and triple compartment models can be used in performing polishing and deburring operations simultaneously.

Egyptian Baking White Enamel

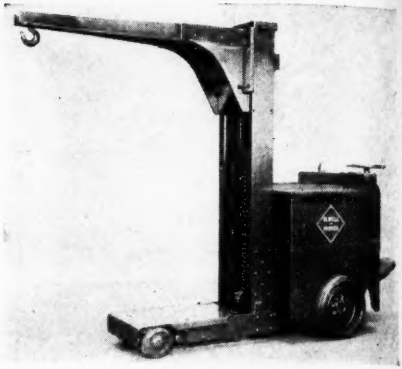
A baking white enamel which is said to be suitable for any product requiring gleaming whiteness, including refriger-

ators, washing machines, cooling units, cabinets, beds, and so on, is announced by The Egyptian Lacquer Manufacturing Co., Rockefeller Center, New York 20, New York.

According to the manufacturer, the enamel can be sprayed on clean bare metal, no primer being needed, and bakes quickly to a hard glossy finish which is resistant to abrasives, acids, alkalies, salt spray, humidity, water immersion, and the softening action of fats and oils.

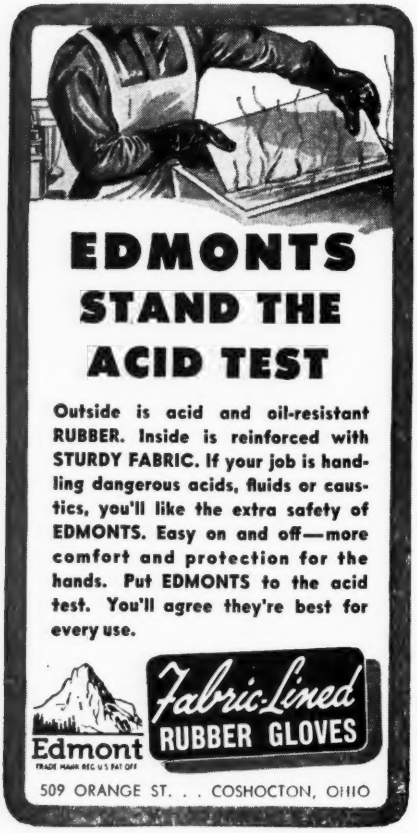
Elwell-Parker Power Truck with Horizontal Non-Swivel Boom

The Elwell-Parker Electric Co., 4205 St. Claire Ave., Cleveland 14, Ohio, has developed a power truck equipped with a horizontal non-swivel type boom which can be operated vertically with its shoulder riding in the upright columns of the truck. This boom is said to be particularly useful for single, heavy and bulky objects to which a hook, chain, rope or cable may be attached, and is arranged to function somewhat as a boom on a crane except that it is more compact and can be maneuvered within more limited areas.



Elwell-Parker Power Truck with Horizontal Non-Swivel Boom

The Elwell-Parker Power Truck with Horizontal Non-Swivel Boom is constructed to handle loads up to 3,000 lb. The boom is available in lengths of 72, 66, and 60 inches from the faces of the uprights. At the lowest point, the hook is 22 inches above floor level and, at the highest point, 8 feet above floor level. The boom may be made interchangeable with a platform whereby a still greater variety of loads may be transported.


EDMONTS
STAND THE
ACID TEST
Outside is acid and oil-resistant RUBBER. Inside is reinforced with STURDY FABRIC. If your job is handling dangerous acids, fluids or caustics, you'll like the extra safety of EDMONTS. Easy on and off—more comfort and protection for the hands. Put EDMONTS to the acid test. You'll agree they're best for every use.
Edmont
TRADE MARK REG U.S. PAT OFF
Fabric-Lined
RUBBER GLOVES
509 ORANGE ST. . . COSHOCTON, OHIO

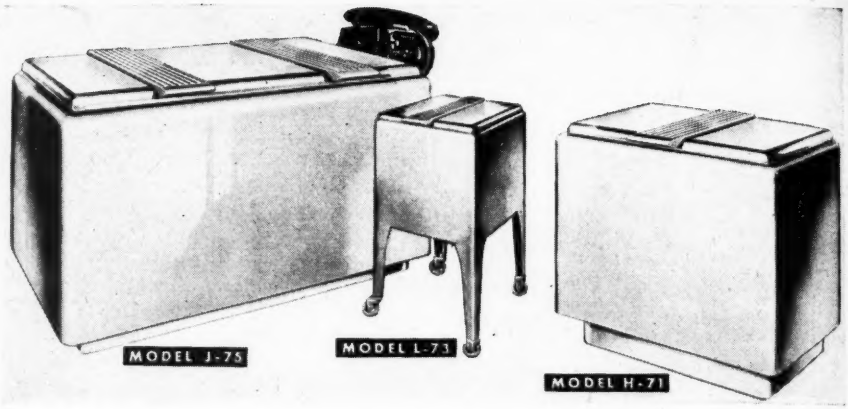
Gray-Mills Parts Cleaning Systems

Three parts cleaning systems designated as the Models H-71, J-75. and L-73 are announced by the Gray-Mills Co., 1948 Ridge Ave., Evanston, Ill. All three models are similar in exterior design and are intended for use with cold solvents.

A general utility unit, the Model H-71 incorporates a centrifugal pump which is used for hose-cleaning parts and for agi-

The saving of time and labor in speeding your product through the plant are more important than the price per gallon of finishing material.

PRATT & LAMBERT-INC.
Industrial Finishes
NEW YORK BUFFALO CHICAGO
FORT ERIE, ONT.



Gray-Mills Parts Cleaning Systems

tating the fluid to accelerate the cleaning of either large parts or small parts contained in baskets. A means for air agitation is also provided. A safety device causes the cover of the unit to close automatically in case of fire. The Model H-71 is 38 inches long x 34½ inches high x 21 inches wide overall.

The Model J-75 is 60 inches long x 34½ inches wide x 33½ inches high and is equipped with a high volume, high pressure rotary pumping unit for hose-cleaning motor blocks and other large parts. The pumping unit is portable and may be used as a general purpose transfer pump for solvents, oils, and so on. This model is also equipped for agitating the fluid by means of air or pump.

The smallest of the three, the Model L-73 is 21 inches wide x 21 inches long x 34½ inches high and is provided with casters, thereby making it easily portable. It is especially designed for use with a special fast-acting type solvent, such as Speed-Agitene for cleaning carburetors, fuel pumps, and so on.

Carbomatic Portable Electric Infra-Red Units

Newly designed and vastly improved over previously available models, the Models W-6 and R-12 Portable Electric Infra-Red Units announced by the Carbomatic Corp., Dept. P146, 117 W. 63rd St., New York 23, N. Y., are constructed for maximum efficiency and full flexibility. The upright vertical stands of both models are made of all-steel electrically-welded channel for durability and rigidity, and both models are mounted on ball bearing swivel casters for mobility.

The Model W-6 has a round all-aluminum reflector, 24 inches in diameter, which may be raised or lowered as re-

New masking method hits a high mark

PRECISION PROTECTORS

Insure perfect masking to line **where you want it.** Quick, easy to attach. Ideal for many masking jobs. Any shape to specification. Low priced. Also make efficient Dust Caps and Thread Protectors.

Send Today For Illustrated Bulletin and Prices

Precision Paper Tube Co.
2053 West Charleston Street
Chicago 47, Illinois

UNICHROME®

AIR-DRY RACK COATING 203

Stands Up Without Splitting or Chipping

Build up the required rack coating thickness with simple dipping and convenient air drying—both at room temperature. And the result is a tough, resilient insulation, well able to take the hard knocks of normal shop handling and repeated racking and unracking of work.

Specially formulated from improved resins, it resists to an outstanding degree the solutions and baths in the plating room. With Unichrome Rack Coating protection, in many shops 500 to 1000 cycles has become the common service life of racks. Write for free trial offer and learn first hand what a difference this rack coating can make in your shop . . . in economy, convenience and trouble-free service. *Reg. U. S. Pat. Off.

PROPERTIES

Chemical Resistance—Excellent for all plating cycles.

Toughness—Withstands repeated flexing and shop handling—cuts cleanly and easily at contacts.

Drying—Dipped in container in which it is shipped and dried at room temperature.

Adhesion—Excellent.

UNITED CHROMIUM, INCORPORATED
51 East 42nd Street, New York 17, N. Y.
Detroit 7, Mich. • Waterbury 90, Conn. • Chicago 4, Ill. • Dayton 2, Ohio

TRY THESE OTHER UNICHROME MATERIALS

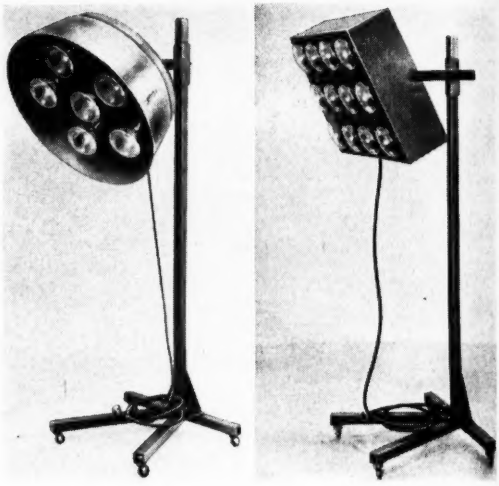
Unichrome Coating 202—which is force dried for the extra adhesion required in anodizing and hot, highly alkaline solutions.

Unichrome Quick Dry Stop-Off 322—for cyanide copper and other plating work requiring extreme adhesion.

Unichrome Quick Dry Stop-Off 323—for chromium and other work requiring a stop-off that can be peeled off.

Unichrome Quick Dry Stop-Off 324—for high temperature solutions. It also resists vapor degreasers for a limited time.

(Left) Carbomatic Model W-6 Infra-Red Unit. (Right) Carbomatic Model R-12 Infra-Red Unit



quired over the entire height of the upright of the stanchion. An adjustable arm permits the direction of the reflector through an arc of 180 degrees. The unit is equipped with a heavy duty extension cord.

The Model R-12 is designed to accomodate 12 lamps and is equipped with three toggle switches, thus permitting the operation of 1, 2, or 3 rows of four lamps each. The unit is made to accommodate up to three reflectors (of 12 lamps each) and is designed so as to enable the user to make up banks or tunnels of any design or shape. Standard make reflector type (R40 or RE40) infra-red lamps are used in both models, and either 125 or 250-watt sizes may be used.

The Carbomatic Models W-6 and R-12 Portable Electric Infra-Red Units may be used in varied industrial and commercial applications for heating, drying, baking, dehydrating, preheating, evaporating, or other similar operations. According to the manufacturer, the operation of either model is instantaneously effected with the turning on of electric current, with the infra-red rays produced penetrating surface film, atmosphere, and so on.

Save Fingers

with Steel-Grip Finger Guards

Hundreds of factories save time and injuries and speed production by protecting workers with Steel-Grip Finger Guards. Used for handling rough or sharp articles, for buffing, grinding, sanding, polishing, punch press work and hundreds of other jobs. Protect fingers or thumb, front or back, from cuts, abrasions or blisters. Made of durable leather with elastic web back for snug, cool, comfortable fit. Easy on and off. One size fits all, men or women. Send 10c each for samples or trial order box of 50 at $4.25 less 10%. *Catalog of Steel-Grip Safety Apparel free on request.*

Famous Industrial Safeguards Since 1910

INDUSTRIAL GLOVES CO.

711 GARFIELD BLVD. DANVILLE, ILL.

Canada: Safety Supply Co., Toronto

Market Forge "Load-Lift" Lift Truck

Completion of a standardized lift truck to be known as the "Load-Lift" is announced by the Market Forge Co., Everett, Mass. Available in capacities of 3,000 and 5,000 lb., the truck utilizes the hydraulic principle in lifting and is equipped with wheels having sealed ball bearings which are said to be lubricated for life. The wheels, which are of all-steel construction to provide for long service, are designed so as to allow for easy movement of the heaviest loads, thus reducing operator fatigue to a minimum. Plastic wheels and rubber wheels can also be obtained, if desired.

An outstanding feature of the Market Forge Load-Lift Truck is the lifting mechanism, each stroke of which is a power

Pen-Kote 500

CHEMICAL-RESISTANT MAINTENANCE PAINT

COVERS *Heated* SURFACES AS READILY AS COLD!

HOT tanks, ductwork and similar surfaces can be painted "as is" with Pen-Kote 500, *without shutdown for cooling!* Where other paints would blister and stiffen on contact with such heated surfaces, this *entirely different* protective coating goes on smoothly and easily with perfect adhesion.

In addition, WET surfaces are painted as readily as dry; and porous surfaces require no primer. Pen-Kote 500 *sets in 30 min. or less* to a hard but flexible film of plastic; and *two coats are sufficient* under the most adverse conditions.

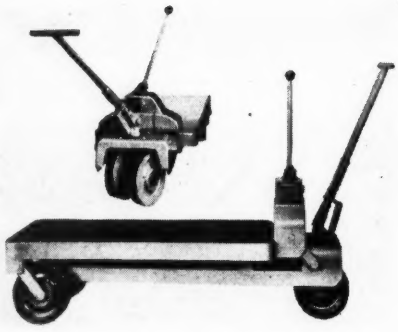
Thus complete protection is obtained much more quickly than with other maintenance paints, at ½ the labor cost or less, and with little or no interference to plant operation.

Pen-Kote 500 is *extremely resistant* to acids, alkalis, water, alcohol, gasoline, oil, and many solvents. It is *odorless* and *non-inflammable*. It gives excellent coverage, and is a perfect sealer—assures a durable, good-looking job. Wide range of colors available. Write today for full information.

Equally outstanding in their own fields are Pen-Kote Masking Lacquers—Pen-Kote Rack Lacquers—Pen-Tape—Pen-Tube—and Pen-Blu. May we send you descriptive literature?

Pen-Kote PRODUCTS

PENINSULAR CHEMICAL PRODUCTS CO.
6795 EAST NINE MILE ROAD
VAN DYKE • MICHIGAN



Market Forge "Load-Lift" Lift Truck

stroke. In this manner, lost motion is said to be eliminated and the platform is claimed to remain stationary at any height. According to the manufacturer, where floors are smooth and free from obstruction, the skid platform legs need only be elevated a fraction of an inch to allow the load to be moved. When obstructions are encountered, a few strokes on the lifting lever will allow the truck to negotiate, it is stated. Lowering of the platform is accomplished through a small accessible lever which controls the speed.

To reduce the possibility of accidents to a minimum, the lifting handle of the Load-Lift has been separated from the lifting mechanism. In addition, precautions have been taken to seal the hydraulic mechanism from foreign matter and to protect the truck from injury by the use of an overload safety valve which is said to allow for a 20 per cent overload before coming into action.

TIME TESTED

4A

Stainless Steel

POLISHING COMPOUNDS

AND 4A CEMENT AND THINNER

FOR POLISHING WHEELS, BUFFS, ETC.

Send for a sample of our 4A Compound or 4A Cement and Thinner and prove to your own satisfaction the quality of our materials.

4A Cement is a substitute for glue used on belts, rolls, wheels, etc. 4A Compounds are used on all kinds of iron and steel, nickel, chrome, and other hard materials.

HARRISON & COMPANY

HAVERHILL, MASS.

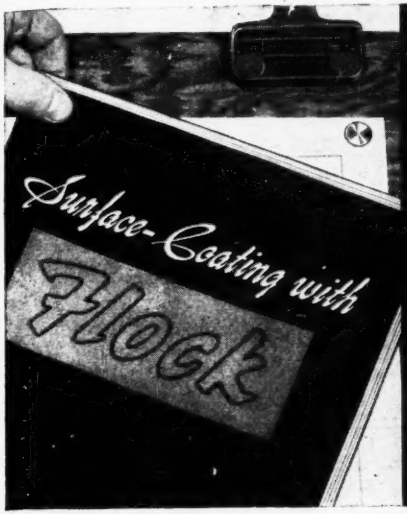
A PRODUCT FOR EVERY FINISH

Roto-Finish 60-Inch Mechanical Finishing Machine

Announcement is made by the Sturgis Products Co., Sturgis, Mich., of a Roto-Finish 60-Inch Mechanical Finishing Machine which provides for the finishing and deburring of parts by a wet process. The machine may be obtained with from one to five compartments, thus permitting the processing of that many different sizes of parts simultaneously. A cam lock provided enables the operator to remove the door easily and quickly and to load and unload the machine in a minimum length of time. The door lock has a spring feature which permits any gases that might build up in the cylinder to escape. The lining of the octagonal cylinder is easily removable, thus permitting the speedy relining of the cylinder with fitted hardwood.

The Roto-Finish 60-Inch Machine employs predetermined combinations of chips and compounds to finish and deburr workpieces at the same time. The action occurring in this process is a precision grinding operation that is said to leave parts with a bright, high color finish readily suitable for plating. Moreover, all parts thus finished are claimed to be uniform as to their surface, and all rough edges and sharp corners are said to be removed.

According to the manufacturer, the Roto-Finish 60-Inch Machine is particularly adaptable to the production finishing of all types of hardware for automotive, plumbing, household, and other assemblies. In using the machine, the workpieces are placed in a wood-lined compartment of the barrel-shaped machine and selected chips and compounds are added. This mass generates as the barrel revolves, thus producing a grinding action which is controlled entirely by the type of chips and compounds em-



Put This Idea-ful Book on Your Design Engineer's board NOW!

FUNCTIONAL USES

Used in the auto, airplane, radio, electrical, phonograph, ceramics, furniture and many other industries for surfacing all sorts of materials to provide

SOUND DEADENING • TEMPERATURE INSULATION • INTEGRAL GASKETS • SHOCK ABSORBING SURFACE • NON-MAR SURFACE • NON-GLARE SURFACE.

DECORATIVE USES

Applied in various lengths and colors to wood, paper, cloth, metal, etc., the following effects are produced

SUEDE LEATHER • FURNITURE UPHOLSTERY • INTERIOR AND DRAPERY FABRICS • VELVET • VELOUR • MOHAIR.

It contains color samples and a wealth of data showing how surface finishing with Rayco flock is used to transform paper, cloth, cardboard, wood, metal, glass, plastic, etc., to synthetic effects of genuine

SUEDE • VELVET • VELOUR
FELT • MOHAIR • CARPET

Available in a host of colors in synthetic and natural fibres, Rayco flock has solved many a finish problem in a simple and economical yet entirely practical way. See that your Design Engineer knows all about it!

REQUEST ILLUSTRATED COLOR BOOK: "SURFACE COATING WITH FLOCK"

RAYON PROCESSING CO. of R.I. INC.

65 TREMONT ST., CENTRAL FALLS, RHODE ISLAND

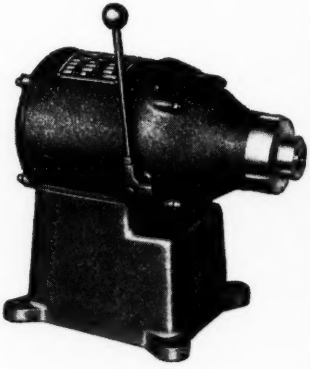
Developers and Manufacturers of Printing and Coating Flock

ployed, the barrel speed, and the length of time of the cycle. Optional equipment available to speed up production includes chip separators which can be obtained in either mechanical, magnetic, or manual types.

Schauer NAO Multi-Purpose Speed Lathe

Featuring design refinements that allow for ease of operation and choice of operating sequence through simple, readily accessible adjustments, the Schauer NAO Multi-Purpose Speed Lathe illustrated herewith, product of the Schauer Machine Co., 2060A Reading Rd., Cincinnati, Ohio, is designed for speedy, general finishing operations on small metal and plastic parts.

The hand-operating lever may be located on the right or left-hand side of the lathe in either a vertical or horizontal position to suit the convenience of the operator. Only 5 lb. pressure on the lever is said to be required in order to open the collet. A simple adjustment affords the operator a choice of two operating sequences. In one, the operating lever provides for the opening of the motor circuit, application of the brake, and opening of the collet. In the other, the motor operates continuously, the brake is locked out, and the operating lever is used only to open and close the collet.



Schauer NAO Multi-Purpose Speed Lathe

The motor is a single speed, 3,450 r.p.m., ¼ h.p. type for operation on 220-440 volts, 60-cycle 3-phase current. The machine is designed for use with a Type 3C collet with maximum capacity for ½-inch round stock and can also be equipped with a 3-inch 3-jaw light-duty chuck. A ½-inch clear hole through the spindle permits rod or bar stock or long workpieces to be handled.

Kindt-Collins Container

A handy container for a wide range of shop uses has been announced by The Kindt-Collins Co., 12651 Elmwood Ave., Cleveland 11, Ohio. The container is sturdily made of heavy aluminum to withstand abuse in daily shop service.

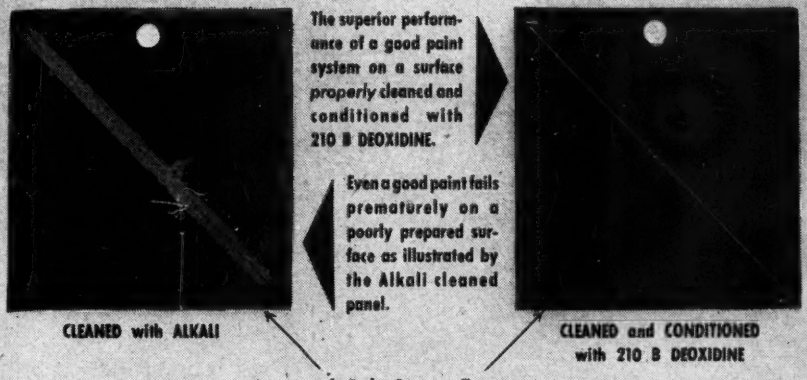
A feature of the can is the crossbar support inside the unit which can be readily removed for cleaning. This support serves both as a wiping bar for surplus material on the brush and as a device upon which to hang the brush when not in use.

The cone-shaped top is designed to fit snugly over the can, covering both the brush and the contents, thus preventing hardening and evaporation. The alum-

Clean Spray Booths

Spray BOOTHCOTE on clean booth.
Paint peels off in sheets.
NO SCRAPING—SAVE TIME and LABOR
Trial offer 5 gal. $5.50 F.O.B. Buffalo
Used by 2000 leading manufacturers.
MONEY BACK IF NOT PLEASED.
Write for Circular.
HYGRADE FOOD PRODUCTS CORP.
HARRIS SOAP—BOOTHCOTE DIV.
19 Stetson St., Buffalo 6, N. Y.

Paint Finishes Endure on Properly Cleaned and Conditioned Surfaces


The superior performance of a good paint system on a surface properly cleaned and conditioned with 210 B DEOXIDINE.
Even a good paint fails prematurely on a poorly prepared surface as illustrated by the Alkali cleaned panel.
CLEANED with ALKALI
CLEANED and CONDITIONED with 210 B DEOXIDINE
Idenncal Salt Spray Exposure

CLEAN AND CONDITION SHEET METAL with 210 B DEOXIDINE

THE 210 B DEOXIDINE process is the simplest and most advanced procedure in metal preparation for paint. A minimum of low-cost operating equipment is required therefore, less than the usual amount of operating space is needed. The fewer necessary operations cut the production costs. Time and labor are saved and better results obtained.

APPLICABLE TO LARGE METAL PRODUCTION
210 B DEOXIDINE is ideal for completely mechanized spray process in power spray washers constructed of mild steel. A three stage washer is usually sufficient, but four stages are preferable if drawing compounds are present.

A NATURAL FOR THE SMALL PRODUCTION PLANT
210 B DEOXIDINE does not require expensive stainless steel equipment. Three stage washers which have previously been used for alkali cleaning can be used. The simplicity of controls of 210 B Deoxidine bath and process lead to uniformly good results.

210 B DEOXIDINE is but one of several war-proved Deoxidines — each created to meet different conditions. ACP Technicians will gladly advise with you and suggest the particular ACP products and processes which will efficiently meet your cleaning and conditioning problems. Write to Dept. A-12.

MANUFACTURERS OF INHIBITORS AND METAL WORKING CHEMICALS

AMERICAN CHEMICAL PAINT CO.

ACP

AMBLER — PENNA.

Office and Warehouse
3665 Palmer Ave., Detroit, Mich.

Canadian Office and Factory
Walkerville, Ontario

DISTRIBUTORS

West Coast
Isaac Finch, Ltd., 728 E. 59th St.
Los Angeles, Cal.

Metropolitan New York Area
Bricker & Andes, 318 Atlantic Ave.
Brooklyn, N. Y.

Eastern Ontario and Quebec
Van Camp Products & Sales Co.
177 Parliament St., Toronto, Ont.

Kindt-Collins Container

inum, it is claimed, will not stain or discolor the contents of the can, which is available in one and two-quart sizes for varying needs involving glues, coatings, and so on.

Porter-Cable Wet Belt Machining Film

A film on the wet belt machining method of surfacing, grinding, and stock removal is now available to engineers, design and production executives, planning and methods engineers, toolroom and die room foremen, and all other interested members of the metal industry through the Porter-Cable Machine Co., 1714 N. Salina St., Syracuse, N. Y. The film, which is sent free upon request for private or group showing, is a 16 mm. sound, black-and-white visual presentation entitled "A Machine of the Age." It can be projected from any standard 16 mm. machine and has a running time of 11 minutes.

"A Machine of the Age" traces the development and perfection of the wet belt machining method from its earliest dry belt forerunners to its acceptance as a machine tool used on production orders running into hundreds of thousand pieces as well as its application to single piece operations in tool and die rooms, repair and maintenance and other departments. Case histories of savings and increased production resulting from this method are presented.

The film shows how surfacing, grinding and stock removal operations are performed. It is complete with technical information on the amount of stock removable, kind of finish attainable, and tolerances held on such various materials as ferrous and non-ferrous metals, glass, plastics, and ceramics.

Specific applications for the wet belt machining method as shown in the film include removing risers, flashings, and parting lines from cast materials; surfacing large, flat areas to close tolerances; and chamfering, edging, squaring, rounding, and cutting radii on single pieces.

Pekay Flex-Disc

A unique type of abrasive disc for use with portable sanding units in performing metal-finishing operations, to be known as the Pekay Flex-Disc, is now being manufactured by The New York Grinding Wheel Corp., 623 Bergen St., Brooklyn, N. Y. In producing the disc, a homogeneous, flexible mass of unusual strength is obtained by curing together three layers of material—a bonded cutting layer, a cloth layer, and a fiber disc. A tough, resilient rubber compound is used to bond the abrasive particles, producing a bonded layer ⅛ inch or more in thickness of grit. The second layer comprises a cloth of high tensile strength and the third layer, a seven-ply tough

PERMAG Compounds will end Metal Cleaning Troubles . . .

PERMAG Compounds quickly remove every trace of dirt, grease—foreign particles that prevent a perfect finish on metal surfaces. PERMAG Compounds are used by leading electroplaters—and have proven their dependability over 22 years.

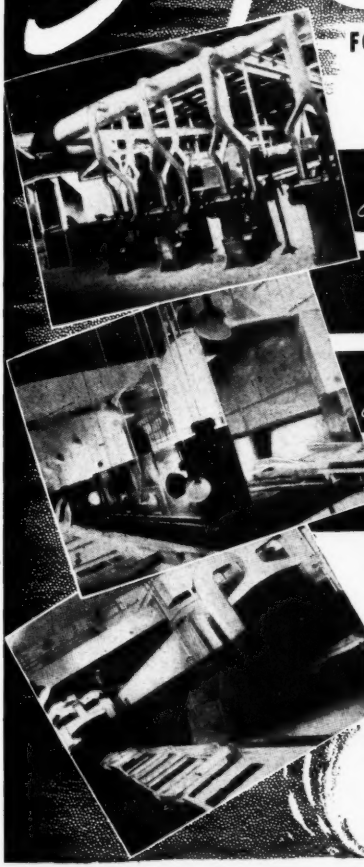
May we send you more details.

MAGNUSON PRODUCTS CORPORATION
Main Office: 50 Court St., Brooklyn, N. Y.
In Canada: Canadian Permag Products Ltd.

Safety IN CONTINUOUS PERFORMANCE

FOR ALL METAL FINISHING SYSTEMS

From your Presses and Grinders to your Assembly Lines or Shipping Room.



Hydro Whirl DUST COLLECTORS

METAL PARTS WASHERS AND RUST - PROOFING MACHINES

Hydro Whirl SPRAY BOOTHS

OVENS EQUIPPED WITH THE LATEST CONTROLS AND SAFETY DEVICES.

Each playing an important part in eliminating hazards to obtain the Utmost Efficiency and Greater Production

Hydro Whirl

EVERY JOB ENGINEERED TO THE LAST DETAIL

WRITE, WIRE OR PHONE FOR INFORMATION

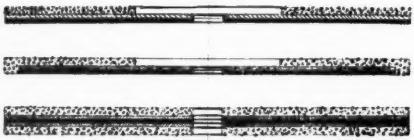
PETERS-DALTON *Incorporated*

17908 RYAN ROAD • DETROIT 12, MICHIGAN

HYDRO-WHIRL DUST COLLECTORS AND SPRAY BOOTHS—INDUSTRIAL OVENS, WASHERS AND VENTILATING SYSTEMS

fiber material. The three layers are held together by a strong resilient cement.

The Pekay Flex-Disc is available with the leading edge elevated so that a thick layer of cutting material is supplied at the point of maximum wear. Discs with grits on both sides for grinding in slots and grooves can be produced. Where sanding units are not portable but stationary, discs can be produced with a plain cloth back for cementing on stationary sanders.



(Top) Single-Sided Pekay Flex-Disc. (Center) Single-Sided Pekay Flex-Disc with Cutting Material on Periphery. (Bottom) Double-Sided Pekay Flex-Disc

According to the manufacturer, the large area of cutting material on the periphery of the Pekay Flex-Disc diminishes the danger to the operator of cutting himself. The disc is manufactured in any diameter up to and including 18 inches and with any size bore desired. The standard thickness is $\frac{1}{8}$ inch, however, thicker discs can be supplied upon request. For highest efficiency, the Pekay Flex-Disc is recommended for operation at speeds not exceeding 8,500 surface feet per minute.

AAF Electro-Airmat Air Filter

A recent addition to the line of electronic air filters marketed by the American Air Filter Co., 125 Central Ave., Louisville 8, Ky., is the AAF Electro-Airmat illustrated herewith in which the collector element is electrostatically charged Airmat paper. According to the manufacturer, the unit has an arrestance rating of 90 per cent or better with atmospheric dust or smoke, this efficiency being obtained at the normal vel-

CLEAN and BRIGHT

. . . . Sparkling as a well-scrubbed tot—That's the way your parts come through with a Blakeslee Solvent Vapor Degreaser. No matter how small or large the part to be cleaned, you will find a tremendous saving in production because of the speed and thoroughness of a Blakeslee-built machine. Fifty years of "know how" enables us to answer your most complicated washing and degreasing problems. Write for free booklet.

BLAKESLEE
Solvent Vapor DEGREASERS
Metal Parts WASHERS

STANDARD AND SPECIALS Engineered for you

G. S. BLAKESLEE & CO., CHICAGO 50, ILLINOIS
NEW YORK, N. Y. TORONTO, ONT.

1946 Resolution
that every American
buy and hold
U. S. Savings Bonds
Assist in building the prosperity of your nation and your own industry—make the wise New Year's resolution to promote the continued sales of E, F, and G Savings Bonds through your Payroll Savings Plan! U. S. Savings Bonds, purchased regularly, form the thrift habit—and enable Americans to secure educational advantages for their children and win financial independence in old age.

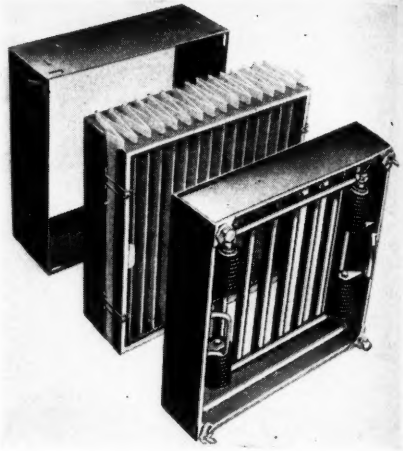
The Treasury Department acknowledges with appreciation the publication of this message by

PRODUCTS FINISHING

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and War Advertising Council

ocity of 35 f.p.m. through the Airmat media and the standard rating of 1,000 c.f.m. for standard size 24 x 24-inch unit.

The Airmat employed in the unit is a cellulose product consisting of a number of plies of porous tissue-like sheets formed of short cellulose fibers in "jackstraw" arrangement. When an electrostatic charge is applied to the Airmat, the plies tend to separate and each individual fiber becomes a collecting electrode which attracts and holds the dust and smoke particles. The Airmat is also said to be a highly efficient mechanical filtering media. Thus, when the power is off for any reason, the Airmat affords ample protection against the infiltration of dust due to "stack effects" in air conditioning systems.



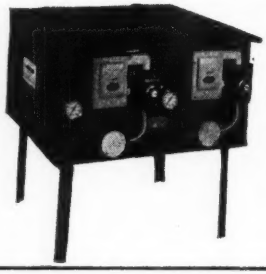
AAF Electro-Airmat Air Filter

Ease of installation and economy and convenience of maintenance are outstanding features. The full height ionizers are said to reduce electrical losses due to the few wire ends. The power pack is designed for operation on 110 volts, 60-cycle single-phase current. The total power consumption is said to be approximately 220 watts at 110 volts.

When the Airmat paper has accumulated its dust load, it can be removed and replaced with clean material by means of turning a crank in a mechanical loader which automatically folds the paper into the serrated base section of

To make an ordinary Oxidizing Solution for Copper Plated Work—
add one ounce
McKeon's
"Liquid Sulphur"
to each gallon water.
SULPHUR PRODUCTS CO.
GREENSBURG 6, PA.

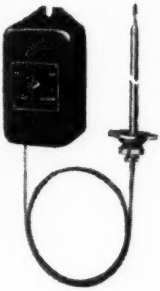
ALLWOOD
"Vienna Brand" Lime
Made from Limestone that is identical in chemical analysis and geological structure with European Imported Lime. Tests show a "lime cake" made from Allwood "Vienna Brand" Lime equals the finish made from imported lime.
WRITE FOR FULL PARTICULARS
ALLWOOD LIME COMPANY
Manitowoc : Wisconsin



SPEED RUST PROOFING AND METAL CLEANING WITH
COOPER'S DOUBLE VICTORY TANK
(two complete tanks in one)
ELECTRICALLY HEATED — THERMOSTAT CONTROL
One man can do the work of 3 to 5 men with COOPER'S DOUBLE VICTORY TANK. Use one side for heating Rust Preventives and second compartment for Wax or one tank for cleaning metals and second compartment for Rinse. A multitude of uses.
D. C. COOPER CO.
1467 S. Michigan Ave. Harrison 8047 Chicago 5, Illinois

BARBER-COLMAN

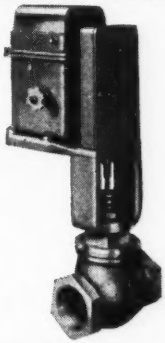
MICRO SYSTEM *for* FINISHING CONTROL



REMOTE BULB MICROTHERM

Plating tanks, anodizing baths, and many other finishing operations where uniform temperature must be maintained, can be improved by using the Barber-Colman automatic electrically-operated "MICRO System" of temperature control equipment. Features include simple construction, no relays, and maximum power at all points of the valve stroke: "Hunting" is eliminated and the valve is positioned quickly with "micrometer accuracy."

Write for Bulletin
"CONTROLS FOR INDUSTRY"



PROPORTIONING VALVE

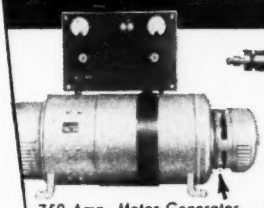
BARBER-COLMAN COMPANY
1248 ROCK ST. • ROCKFORD, ILL.

MGC *Electroplating Equipment*
—INSURES HIGH GRADE PLATING AT LOW COST

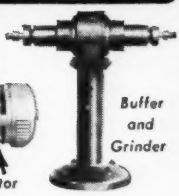
MGC Motor Generator Sets give you better plated surfaces and maximum economy in operation because—ball bearings guarantee maintenance of uniform air gap and good commutation; special windings assure positive voltage regulation; compact single unit construction gives longer life with less maintenance.

MGC Buffers and Grinders are especially adaptable for all plating work and will give dependable, trouble-free service. Give us your requirements. We'll give you details without obligation.

Motor Generator Corp., Box PF-26 Troy, Ohio
(Division of Hobart Brothers Co.)

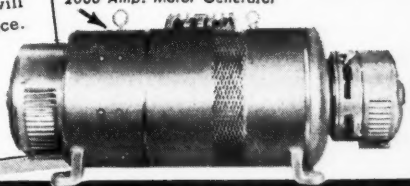


750 Amp. Motor Generator



Buffer and Grinder

2000 Amp. Motor Generator



"One of the World's Largest Builders of Electric Generators"

the filter unit. Spare cells loaded with clean Airmat can be provided for convenience in servicing.

Pioneer "Stanzoil" Neoprene Work Glove

Safety red, warning a worker when his hands are dangerously near moving machinery, is a feature of the Neoprene-coated canvas glove designed for industrial use by the Pioneer Rubber Co., Willard, Ohio. Oil and acid resistant, the glove, which is known as the "Stanzoil," is made of milled Neoprene, which provides a tough coating for unusual resistance to abrasion and other wear hazards. Curved fingers afford maximum comfort and make gripping tools and other objects easy.

Pioneer "Stanzoil" Neoprene Work Glove

Made in both a knit (No. R-26) and gauntlet (No. R-27) wrist style, the Pioneer Stanzoil Neoprene Work Glove is available in one standard size.

Nox-Rust Rust Remover

The Nox-Rust Chemical Corp., 2429 S. Halsted St., Chicago 8, Ill., has developed a rust remover which is said to be scientifically compounded to wet metal thoroughly, dissolve rust scale rapidly and remove it completely, and to be relatively non-corrosive to steel even under conditions of long exposure. According to the manufacturer, the product is particularly effective in removing rust from precision bearings and machined surfaces without affecting critical dimensions. Ordinary rust can be removed in a matter of seconds with the material, which leaves no perceptible etching or discoloration of surfaces, it is claimed.

Nox-Rust Rust Remover can be applied by the brush, spray, or dip method, however, because of its long life and rapid action in otherwise inaccessible crevices, the product is said to be most economically employed in connection with the dip method. Specific applications for the material include the removal of rust from castings, steel stock, fabricated parts, hand tools, periodically idle farm and process equipment, sporting goods, and items exposed to weathering during storage.

Nox-Rust Rust Remover is available in pint to tank-car quantities.

J & J Engineering Company

Builders of

INDUSTRIAL FILTERS for Electroplating solutions, oils, solvents, water and alcohol.
SALT FOG TESTING EQUIPMENT to latest Gov't. Specs.
RUBBER LINED Tanks, valves and fittings.
Try the filter with the scientifically designed air wash method of cleaning.

J & J Engineering Company

1819 N. New England Ave., Chicago 35, Ill.

\$75 invested in Victory Bonds today would return you \$100 in ten years. You'll wish then you had bought those bonds today.

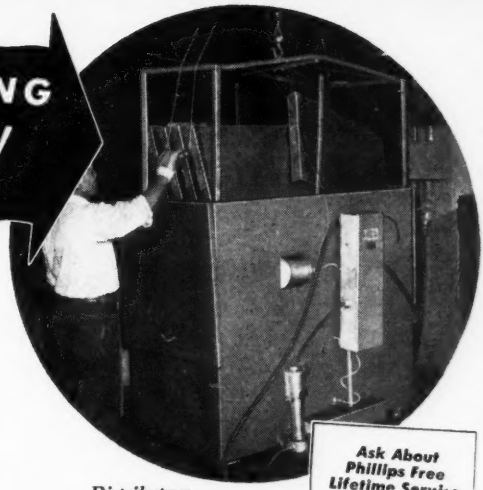
For a real good polishing job use

KEYSTONE EMERY

TURKISH — NAXOS — AMERICAN

KEYSTONE EMERY MILLS *Write for Sample* **4316 Paul St., Phila., Pa.**

METAL CLEANING *Simplified!*



PHILLIPS VAPOR DEGREASERS
give you

- √ **68% greater flushing action.**
- √ **66⅔% *less* evaporation loss.**
- √ **Reclaims solvent while working . . . No shutdowns.**
- √ **Plug in and start work . . . No installation.**
- √ **Safest cleaning . . . Lowest toxicity.**

Using PHILLSOLV... The Safe, High Efficiency, Premium vapor degreasing solvent.

Ask About Phillips Free Lifetime Service Policy

Distributors in Principal Cities

Manufacturers of a Complete Line of Metal Cleaning Machinery

PHILLIPS MANUFACTURING CO.

3436 W. TOUHY AVE. CHICAGO 45, ILL.

For . . . . . LONG LIFE PRACTICAL SERVICE

Hisey TEX-DRIVE BUFFER-POLISHER

Designed specifically for heavy duty work, Hisey Tex-Drive Buffing and Polishing Machines will give you year after year of trouble free service.

Manufactured with one or two motors in a wide variety of sizes, from 1 to 15 H.P., these machines cover the range of finishing operations and assure you efficient and economical service.

Write for Catalog 70J

Hisey THE HISEY-WOLF MACHINE CO. CINCINNATI, OHIO.

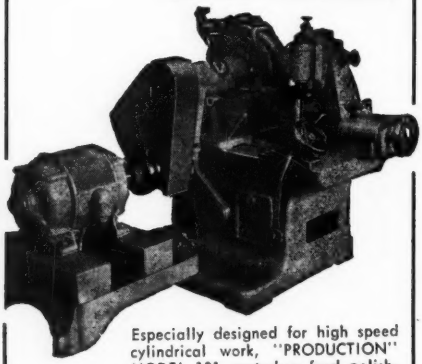
Surface Active Agents. By C. B. F. Young and K. N. Coons. Published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Illustrated. Cloth binding, board covers. Price, $6.00.

The theoretical aspects of surface tension and its application to various industrial fields are treated in this comprehensive book. The authors discuss, besides the results of others, the conclusions drawn from their own research work in various industries, and endeavor to present useful information concerning the origin, effect, and utilization of surface tension phenomena.

The relation between surface tension and other physical properties of matter and the characteristics and effects of surface active agents are treated in detail. Methods for the determination of surface tension are described and the apparatus used is illustrated. Included is a comprehensive alphabetical list of wetting and other surface active agents, giving also the chemical composition, the industrial use, as well as the names and addresses of the manufacturers.

The remainder of the book deals with diverse branches of industry in which surface active agents are used and contains many typical formulas for facilitating the formulation of emulsions and other products based on the utilization of surface active agents. Numerous illustrations, tabulated data, a well selected bibliography, and chemical and mathematical equations round out the uesfulness of the book, which should be equally welcomed by chemists, engineers, technicians, executives, salesmen, students, and laymen who desire to acquire an up-to-date knowledge of the subject.

LOWER COST . .
BETTER FINISHING



Especially designed for high speed cylindrical work, "PRODUCTION" MODEL 101 centerless feed polishing machine produces better finishing at lower cost. It feeds automatically without centering, chucking or holding. All parts are guarded and readily accessible for changing the wheel. The construction is rigid and durable throughout. Write for illustrated folder.

PRODUCTION MACHINE CO.
GREENFIELD, MASS.

Plastics. Third edition. By J. H. Dubois. Published by American Technical Society, 830 E. 58th St., Chicago 37, Ill. 447 pages. 214 illustrations (two pages in four colors), 52 tables. Washable cloth binding, board covers. Price, $4.00.

A simplified presentation of the important plastics materials and products with tables of their properties and the basic design information required by engineers and designers, this volume explains in narrative and interesting form how various common materials and even waste or by-products are put together to form the several plastic materials now available for use. It provides an excellent historical account of all plastics and traces the discoveries, developments, and experimentations in such a manner that the reader is said to quickly sense the drama involved and build up his interest at once.

The book omits formal chemistry but explains that which happens when various materials are handled in certain manners. It stresses how all plastic materials are used, what can be made with them, where to use various kinds, which will withstand fire, which can be remelted, how to form into commodities, required tooling, machining, and so on. Thus, the book is intended for the user of plastics and **not** the chemist or research laboratory. It has also been written for users of plastics who require basic design information but cannot spend the time necessary for a detailed study of chemistry or the complex manufacturing problems of the molder or fabricator.

Please mention PRODUCTS FINISHING when writing to advertisers. Your cooperation will be appreciated both by this magazine and the advertisers.

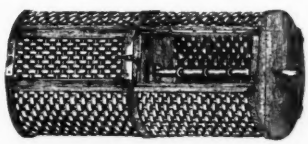
If its metal polishing or metal finishing you want, check LUPOMATIC.

For efficiency in finishing metal parts, install a DEBURRMASTER.

Save time, money and produce assured results.

LUPOMATIC TUMBLING MACHINE CO., INC.
4510 BULLARD AVE. BRONX, N. Y.

Inexpensive, light in weight. Easy to install and operate.



King White-Oak Plating Barrel

becomes a sub-anode, thereby producing a cleaner, brighter plate. Less plating time is required to put on the desired thickness of plate.

Send for catalogue and specification sheets.

JOHN KING 48 SPRINGFIELD ST. DAYTON 3, OHIO

PUT THIS INDUSTRIAL GIANT TO WORK FOR *you!*

CARBOMATIC INFRA-RED

GAS OR ELECTRIC UNITS

- DRYING
- SINGEING
- BAKING
- PRE-HEATING
- ANNEALING

Amazing economies are typical of CARBOMATIC Infra-Red installations now in use in many textile plants. We suggest that you investigate the possibilities of this modern industrial giant.

Our engineering department will be glad to show you how CARBOMATIC Infra-Red can revolutionize your heating methods.

- CURING
- ROASTING
- CARBONIZING

If it's Infra-Red . Be Sure it's CARBOMATIC!

Send for Comprehensive Broadside PF2

INFRA-RED DIVISION

CARBOMATIC CORPORATION

117 WEST 63rd ST. • NEW YORK 23, N. Y.

Also—H. W. Butterworth & Sons Co., Philadelphia, Pa.
In Canada—Canadian Textile Engrg. Ltd.
980 St. Antoine Street, Montreal, P. Q.

The Finishing Touch — **By J. A. Patterson**

"I don't give a hoot if you are scared of dentists— That's no way to grind that buck tooth down!"